

PLATE I.



The uterus at full term, seen from in front.

(From the Author's 'Manual of Midwifery.'

A SHORT PRACTICE OF MIDWIFERY

EMBODYING THE TREATMENT ADOPTED IN THE
ROTUNDA HOSPITAL, DUBLIN

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WITH A PREFACE BY

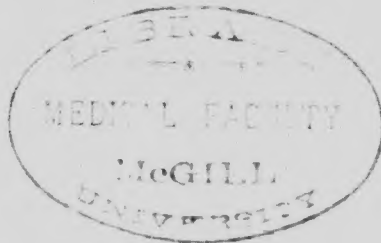
SIR W. J. SMYLY, M.D., F.R.C.P.I.

FORMERLY MASTER OF THE ROTUNDA HOSPITAL

SIXTH EDITION, REVISED

TWENTIETH THOUSAND.

*With Four Coloured Plates and 207 Illustrations, and an Appendix
containing the Statistics of the Hospital for the last
twenty-two years*



TORONTO

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PREFACE TO THE FIRST EDITION

I AM sure that Dr. Jellett's little book will prove acceptable to many practitioners and students who desire a succinct account of the methods adopted in the Rotunda Hospital, in the management of parturient women. In many particulars the views expressed are at variance with the rules laid down in most text-books, and I may here emphasise a few of these. It has been shown that, whereas in hospitals the introduction of antiseptics has been followed by most gratifying results, in private practice little if any improvement is observable. To account for this deplorable state of affairs, it has been pointed out that proper precautions are not so universally adopted by practitioners and nurses as they should be; and also on the other hand, that too much reliance upon antiseptic methods has encouraged "meddlesome midwifery"; so that what has been gained by the former has been sacrificed by the latter. The recommendations in this work regarding the substitution, as far as possible, of external for internal manipulations; the avoidance of routine douching, of the use of the plug in abortions and placenta prævia, and of the forceps in cases where the head has not passed the pelvic brim; and the management of the third stage of labour, are matters of the greatest importance. I am entirely

in accord with the statement that a practitioner can appraise his own merits by the infrequency of post-partum hæmorrhage in his practice.

The subjects, which will probably provoke most criticism, are the methods of treatment recommended in accidental hæmorrhage and eclampsia. In the first two years of my Mastership, I treated all serious cases of accidental hæmorrhage by rupturing the membranes; and, if that did not prove effectual, delivery was effected by version and extraction or perforation. The results were so bad that I resorted to plugging in all cases of external accidental hæmorrhage in which the membranes were intact, and labour pains absent or feeble—that is in the great majority of cases—and with excellent results. The fear that an external would be converted into an internal hæmorrhage proved groundless. The use of chloroform in puerperal eclampsia I abandoned with the greatest reluctance. Nothing is more gratifying to the practitioner himself and the relatives of the patient than the complete control of the convulsions by chloroform, but it does not save the patient's life; on the contrary, it increases the tendency to death.

Even to those who differ from the views advanced, this little work will afford matter for reflection, especially as the results of the treatment advocated can be judged from the statistics appended.

W. J. SMYLY, M.D., F.R.C.P.I.,

Ex-Master of the Rotunda Hospital, Dublin.

March, 1897.

PREFACE TO THE SIXTH EDITION

THE present edition has been thoroughly revised, and brought into conformity with the practice of the Rotunda Hospital at the present time. My Publishers have thought well to increase the size of the page in order to enable better illustrations to be used. The amount of letter-press in the book is, however, practically the same as in the last edition. A considerable number of new illustrations have been added. The arrangement of the chapters is similar to that adopted in the last edition, and so corresponds with my larger 'Manual of Midwifery.' The statistics of the Rotunda Hospital in the appendix have been brought up-to-date, 36,227 cases of labour being analysed. I am very much indebted to Dr. Rowlette, and to my Assistants, Dr. Madill and Dr. Allan, for kindly reading the proof sheets and otherwise helping me in the preparation.

HENRY JELLETT.

ROTUNDA HOSPITAL, DUBLIN;

March, 1913.

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A SHORT PRACTICE OF MIDWIFERY

CHAPTER I.

ASEPSIS IN MIDWIFERY.

Importance of Asepsis in Midwifery—Mechanism by which the Uterus is kept Aseptic during Pregnancy and Labour—The Vaginal Secretion—The Operculum—Method of Sterilising the Hands and the Instruments—Prophylactic Douching—Douching Solutions—Preparation of Patient for an Obstetrical Operation.

It is not an exaggeration to say that the most essential knowledge in midwifery is the knowledge of asepsis. A practitioner who knows nothing of the science and art of midwifery, except that it is necessary that his hands and instruments are sterile, will save more lives than the most accomplished obstetrician who does not practise asepsis. It is therefore most fitting that the first chapter of this little book should deal with the practice of asepsis in midwifery.

If there were no such things as vaginal examinations, or as intra-vaginal or intra-uterine operations, a pre-

viously healthy patient, confined in proper hygienic circumstances, would never suffer from acute sepsis. This being so, there must be some natural mechanism which guards against the entrance of pyogenic organisms into the uterus. At the beginning of labour a healthy vagina is lubricated with a fluid, which is composed partly of the secretion of the cervical glands, and partly of serous transudation from the vaginal blood-vessels. This fluid is swarming with bacteria, which not only are not pyogenic, but are a direct bar to the entrance of pyogenic bacteria (Döderlein). They act by the formation of lactic acid, which renders the vaginal discharge acid, and so prevents the development of pyogenic organisms, as the latter can only exist in an alkaline medium. Their antiseptic effect is further assisted by phagocytic action and by the absence of oxygen in the vagina. It has been found by experiment that pyogenic organisms introduced into the vagina are destroyed in a few hours.

In addition to the protection furnished by the vaginal discharge, there is a further bar to the entrance of bacteria into the uterus; this is the plug of mucus which fills the cervix, the so-called *operculum*. This plug is described as consisting of three layers, an upper or uterine layer, a middle or cervical layer, and a lower or vaginal layer. The upper layer contains no bacteria of any kind, and so is aseptic. The middle layer contains dead bacteria and quantities of white corpuscles. These latter act as phagocytes, and hence the middle layer is antiseptic. The lower layer contains swarms of bacteria,—non-pathogenic if the vagina is healthy, and pathogenic if there is any form of vaginitis present; it therefore may be septic. It is said that no bacteria can find their way past the middle layer of the operculum except gonococci. Thus, by the aid of the

vaginal bacteria and of the operculum, the uterus is kept aseptic before delivery.

After the birth of the child, all bacteria have disappeared from the vagina. This is brought about in the following manner:—When the membranes rupture, the flow of liquor amnii through the vagina washes away the greater number of micro-organisms. Then, the presenting part of the child, as it passes through the vagina, distends its walls to the utmost, so that the second rush of liquor amnii, and after it the placenta, are enabled to wash away all that remain. Thus the uterus is prevented from becoming infected after delivery, the time at which it is exposed to the greatest risks.

If vaginal examinations have to be made, or operations performed, these natural methods of protection are insufficient, and consequently, in such cases, it is incumbent on us to do everything in our power to avoid the introduction of bacteria. They may be introduced in three ways:—

- (1) By septic hands.
- (2) By septic instruments.
- (3) By carrying up septic matter from the vulva or vagina on our fingers or instruments into the uterus.

(1) To avoid the first, the hands must be cleansed thoroughly. The following is a satisfactory method of disinfecting the hands, it possesses the advantage of not requiring the use of several different kinds of antiseptics, and it has stood the test of time at the Rotunda Hospital and in many other places. It is carried out as follows:—Cut the nails short, and remove gently with a penknife any superfluous skin which may surround them. Wash the hands with any good soap—carbolic, if wished—and a nail-brush for from

three to five minutes, in plain water or in a one per cent. solution of lysol. Special attention must be paid to the nails and the skin surrounding them. Wash off all trace of soap from the hands, and then immerse them for one minute in a 1 in 500 solution of corrosive sublimate in water. If the obstetrician does not like corrosive sublimate, he can substitute for it mercuric potassium iodide, a substance which has the advantage over corrosive sublimate that it does not cause blackening of the finger-nails. It is also said to be more powerful and at the same time to be less toxic, and so to be less dangerous. It possesses the properties of the red iodide of mercury, but is considerably more soluble. It is used at a strength of 1 in 1000. If the hands have been in contact with pus or other septic material, a more rigorous method of disinfection should be adopted, such as the following :—Scrub the hands for five minutes in warm water with soap and a nail-brush. Then scrub them for from three to five minutes in absolute alcohol, and finally soak them in an antiseptic such as corrosive sublimate. Avoid the use of lubricants, if possible. If one must be used, let it be thoroughly aseptic. Carbolised vaseline is never safe, particularly when kept in a box into which dirty fingers are introduced from time to time. Soap, which has been boiled in the making, furnishes an excellent and safe lubricant. It requires one precaution, viz., that the outer layer is first washed off, and thus any dirt which was in contact with it removed. The inner layer is aseptic.

In addition to the thorough disinfection of the hands, the routine use of rubber gloves is advisable. Even with the most careful and prolonged washing, it is impossible to *sterilise* the hands, whilst rubber gloves which have been previously boiled are always sterile. We therefore strongly advise their use in all cases. At

first they may cause a little awkwardness by blunting the sense of touch, but this is only an initial difficulty, and is quickly overcome. Their use is especially necessary in the case of the general practitioner, who cannot keep his hands as free from contact with septic matter as can the specialist, but even by the latter they should always be worn.

(2) To avoid the second method of infection, instruments must be, as far as possible, of metal, to enable them to be boiled. This should be done for at least five minutes. If a one per cent. solution of common washing soda is used, the instruments will not become rusty.

(3) To avoid the third method of introducing infection, the vulva must be thoroughly washed and disinfected by the nurse before any examination is made. If an operation has to be performed, which necessitates the introduction of fingers or of instruments into the uterus, the vagina must be disinfected as well. This is done because, in many cases, the vaginal discharge is not normal; and also because bacteria, which may be non-pathogenic in the vagina, may become pathogenic by feeding upon dead tissue, blood-clots, etc., in the uterus. To disinfect the vagina, it must be thoroughly douched with a solution of cyllin, scrubbed all round with several successive pieces of sterilised wool or tow held in a sponge forceps and soaked in a boiled solution of soap, and then douched again. If this is not practicable, the vagina should be well washed with the fingers and a small piece of soap, which has first been well washed, and when the disinfection is finished a clean pair of gloves should be put on.

A few words must be said on the subject of routine prophylactic douching, *i.e.* douching before and after labour with a view to preventing sepsis, a practice

which is recommended by many obstetricians. Before adopting a general principle of treatment which is obviously not dictated by nature, it is well to ask certain questions. Is the particular practice which we are about to adopt necessary or unnecessary, free from danger or dangerous? If it is proved to be necessary in some cases, is it so in all cases? If it is not so in all cases, can we formulate rules which will govern its use in the particular case in which it is required?

Douching, like vaginal examinations, can never be wholly free from danger, hence its use must be entirely controlled by the necessity for it. Assuming the truth of Döderlein's investigations into the condition of the vagina during labour, routine ante- or post-partum douching is obviously not necessary when the genital tract is in a healthy condition, and when intra-uterine manipulations are not necessary. It is equally obvious that, in cases of putrefaction or suppuration in or near any part of the genital tract, douching is advisable, provided we do not carry infection from one part of the tract to another in our endeavour to remove it. Following this line of reasoning we find that ante-partum douching is indicated—

- (1) If any operation is about to be performed.
- (2) If there is any purulent or putrid discharge from the vagina or the uterus.
- (3) If the patient is a very long time in the second stage of labour. In these cases, the liquor amnii drains away slowly, and, by the time the head is born, there is not sufficient left to wash out the vagina. Also, during the protracted labour, some of the liquor amnii may lie in the vagina and decompose.

Prophylactic post-partum uterine or vaginal douching is a practice which must be even more strongly condemned than ante-partum douching. Inasmuch as it

has been proved that the vagina is free from bacteria after delivery, it is quite unnecessary. In addition, when the douche is administered as a routine practice by an ignorant nurse, with a much used Higginson's syringe, and at a time when the absorption of septic organisms is so easy, it is extremely dangerous. Like ante-partum douching, a post-partum uterine or vaginal douche is indicated under certain conditions, and must then be regarded as a serious operation, and performed with the strictest attention to asepsis. If possible, it should be administered by the medical attendant himself. Accordingly, prophylactic post-partum douching is indicated under the following conditions :—

- (1) If the hand has been introduced into the uterus, *e.g.* for the removal of a placenta.
- (2) If the foetus, placenta, or liquor amnii is putrid.
- (3) If there is a purulent discharge from the uterus.
- (4) If the lochia becomes putrid at any time during the puerperium.

For the purpose of douching, cyllin and water, of a strength of half an ounce of the former to a gallon of the latter, or a one per cent. solution of lysol, is best. A douche should be administered at a temperature of 100° F. (38° C.) in ordinary cases, but to check hæmorrhage the temperature may reach 120° F. (49° C.). Corrosive sublimate is almost useless for the purpose of douching, and should never be used. Before labour, it corrugates the tissues and makes them rigid, so that lacerations are very liable to occur. After delivery, if used too strong, or if any is left behind, it may cause symptoms of mercurial poisoning. Douches do not destroy bacteria in the vagina and uterus by means of the antiseptic in the douche, as the fluid does not remain in contact with them for a sufficient length of time. Bacteria are removed mechanically by the flow

of fluid and by the removal of any *débris* in which they may be developing, whilst the antiseptic merely helps to render the water in the douche aseptic. Coal-tar derivatives, as cyllin and carbolic acid, are said in addition to cause a leucocytosis, so increasing phagocytosis.

We should, therefore, begin every obstetrical operation, in which either hands or instruments have to be introduced into the uterus, in the following manner:—

(1) Wash the external genitals and the skin round them thoroughly with soap and water, applied either with successive pieces of sterilised cotton-wool or tow held in a forceps, or with the fingers. In the latter case, again wash the hands, put on gloves, and—

(2) Douche out the vagina thoroughly with cotton-wool or tow, or with cyllin or lysol solution, then scrub its walls with the fingers and a clean piece of soap, and then douche it out again. If the washing is done with the fingers, put on a clean pair of gloves before performing any operation.

CHAPTER II.

THE BONY PELVIS.

The Bony Pelvis—The Diameters of the Pelvis—The Inclined Planes.

THE bony pelvis is formed by four bones—the two innominate bones, the sacrum, and the coccyx (*v.* Fig. 1). These articulate in the following manner:—Each innominate bone articulates with the sacrum at the sacro-iliac joints, and with its fellow at the pubes. The sacrum articulates with the last lumbar vertebra at the lumbo-sacral joint, with the two innominate bones at the sacro-iliac joints, and with the coccyx at the sacro-coccygeal joint. The coccyx articulates with the sacrum alone. The joints are usually rigid, but towards the end of pregnancy their ligaments soften, and so permit slight movements to take place. The sacrum rotates antero-posteriorly, as if it was pivoted upon the sacro-iliac joints. As the fetal head descends, it presses upon the promontory of the sacrum and forces this slightly backwards. As soon as the head has passed the brim, the promontory returns to its original position, and then moves slightly forwards, as the descending head drives the lower pieces of the sacrum backwards. The coccyx can also move backwards on the sacro-coccygeal joint, and thus increase the antero-posterior diameter of the outlet by

about three-quarters of an inch. The pubic bones can separate slightly at the symphysis.

The true pelvis possesses certain diameters which are of great importance. These are the diameters of the brim and the diameters of the outlet. The brim has four chief diameters, and by their measurement we

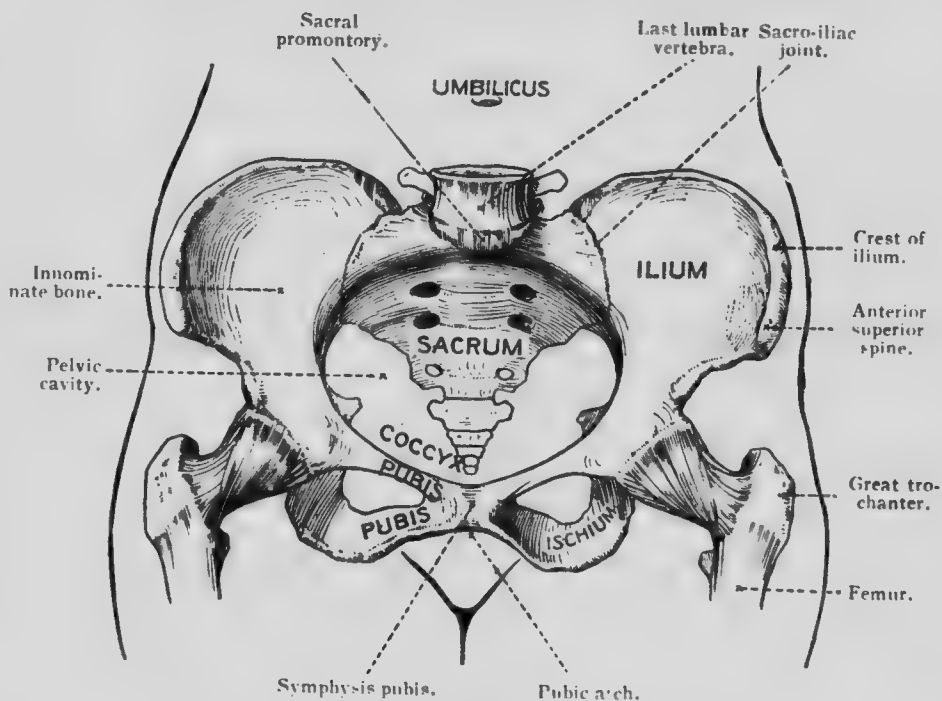


FIG. 1.—The adult female pelvis, seen from in front.

can ascertain its shape and size (v. Fig. 2). They are :—

(1) *The antero-posterior diameter (conjugata vera)*, i. e. the distance between the promontory of the sacrum and the upper margin of the symphysis. The so-called "obstetrical conjugate" is measured from the same point to the most prominent part of the inner surface of the symphysis pubis. Both diameters

measure normally from 4 to $4\frac{1}{4}$ inches (10—10·5 cm.), but sometimes there may be a deformity of the back of the symphysis which makes the obstetrical conjugate slightly the shorter.

(2) *The transverse diameter, i. e.* the greatest distance between the lateral margins of the brim. It measures $5\frac{1}{4}$ inches (13 cm.).

(3 and 4) *Two oblique diameters, right and left, i. e.*

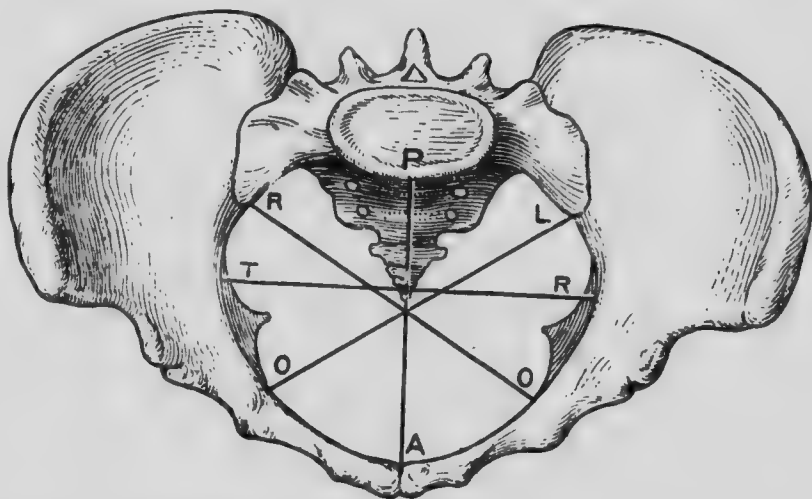


FIG. 2.—The female pelvis, seen perpendicularly to the axis of the brim. A, P. True conjugate diameter. T, R. Transverse diameter. O, R. Right oblique diameter. O, L. Left oblique diameter.

the distance between the sacro-iliac joint on one side and the pectineal eminence on the opposite side. The right oblique diameter runs from the right sacro-iliac joint to the left pectineal eminence; the left oblique diameter runs from the left sacro-iliac joint to the right pectineal eminence. They each measure about 5 inches (12·5 cm.).

The outlet has two chief diameters (*v.* Fig. 3):—

(1) *The antero-posterior diameter, i. e.* the distance

from the tip of the coccyx to the lower border of the symphysis. It measures $3\frac{4}{5}$ inches (9.5 cm.), and can be increased by three-quarters of an inch by the backward movement of the tip of the coccyx.

(2) *The transverse, i. e.* the distance between the tuberosities of the ischii. It measures $4\frac{2}{5}$ inches (11 cm.).

It is also well to know the measurement of the

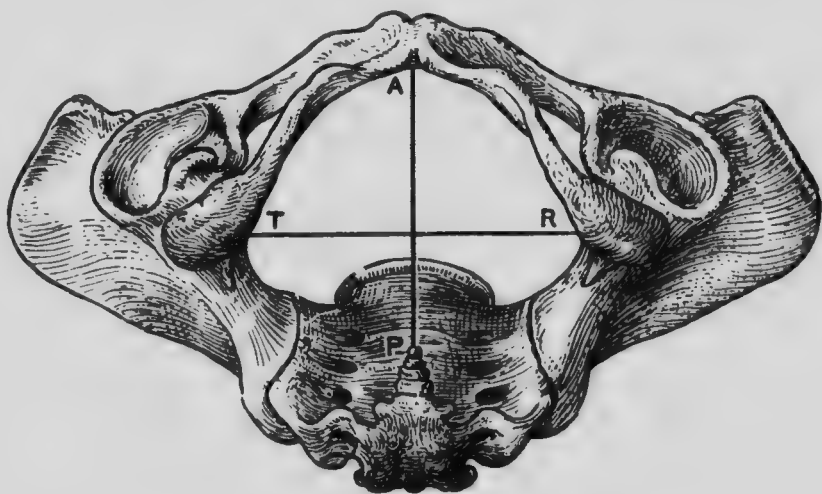


FIG. 3.—Outlet of pelvis. A, P. Antero-posterior diameter. T, R. Transverse diameter.

pelvic cavity,—first, in its plane of greatest expansion ; and secondly, in its plane of greatest contraction (*v.* Fig. 4). *The plane of greatest expansion* passes through the middle of the symphysis and the junction of the second and third pieces of the sacrum. *The plane of greatest contraction* passes through the lower margin of the symphysis and the lower margin of the last piece of the sacrum. For the sake of convenience, a table is appended of the diameters of the pelvis in these various planes :—

| | Antero-posterior diameter. In. (Cm.) | Trans- verse. In. (Cm.) | Oblique. In. (Cm.) |
|-----------------------------|--|-------------------------------|-----------------------|
| Brim | $4\frac{1}{4}$ (11) | $5\frac{1}{4}$ (13) | 5 (12.5) |
| Plane of greatest expansion | 5 (12.5) | $4\frac{1}{2}$ (12) | |
| " greatest contraction | $4\frac{1}{8}$ (10.5) | 4 (10) | |
| Outlet | $3\frac{1}{2} + \frac{1}{2}$ (9.5 + 2) | $4\frac{3}{8}$ (11) | $4\frac{7}{8}$ (11) |

The inclined planes of the pelvis, which concern the obstetrician, are two in number. They start one at each

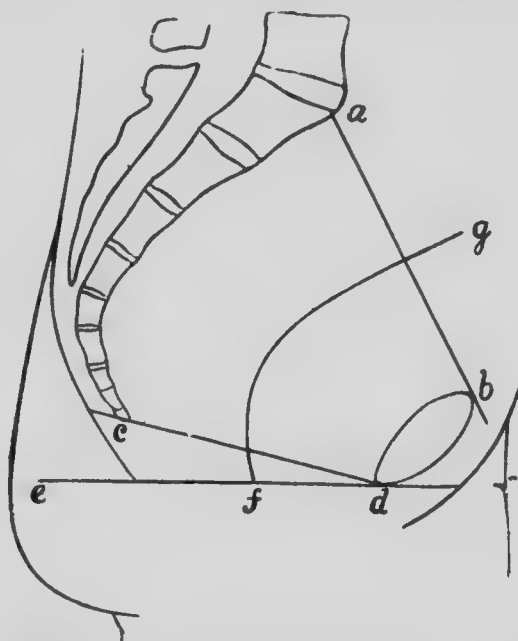


FIG. 4.—Median outline section of a female pelvis. *a, b.* Line of inclination of the brim of the true pelvis. *c, d.* Line of inclination of the outlet of the true pelvis. *g, f.* Axis of the pelvic canal. *e, d.* Horizontal line through the lower margin of the symphysis.

side in front of the ischiatic spines, and slope downwards and forwards over the ischium (*v.* Fig. 5). They are so placed that the part of the child, which first impinges on either of them, is directed downwards and forwards, and consequently they are a factor in the causation of internal rotation (*v.* page 151).

There are other measurements of the pelvis which are of importance. They are as follows :—

| | Inches. | (cm.) |
|---|-------------------|--------|
| The distance between the anterior superior spines . . . | $= 10\frac{1}{2}$ | (26.5) |
| " " iliac crests . . . | $= 11\frac{3}{8}$ | (28.5) |
| The height of the posterior wall of the pelvis . . . | $= 5\frac{1}{2}$ | (13) |
| " " " " " " . . . | $= 1\frac{3}{8}$ | (4) |



FIG. 5.—Median section of a female pelvis. 1. Symphysis pubis. 2. Promontory of the sacrum. 3. Coccyx. 4. Anterior superior spine of ilium. 5. Tuberosity of ischium. 6. Spine of ischium. The vertical and horizontal lines help to show the normal inclination of the pelvis when the woman is in the erect posture. (Reduced one-third from *Naegle*.)

| | | |
|---|-------------------|------|
| The external conjugate, <i>i.e.</i> the distance between the depression below the last lumbar spine and the upper margin of the symphysis . . . | $= 8$ | (20) |
| The oblique conjugate, <i>i.e.</i> the distance between the promontory of the sacrum and the lower margin of the symphysis . . . | $= 4\frac{1}{2}$ | (12) |
| The inter-trochanteric distance, <i>i.e.</i> the distance between the summits of the great trochanters . . . | $= 12\frac{1}{2}$ | (31) |
| The distance between the posterior superior spines . . . | $= 3\frac{1}{2}$ | (9) |

CHAPTER III.

THE OVUM.

Embedding of the Ovum. Growth of the Ovum. Full term ovum; Placenta; Chorion; Amnion; Umbilical Cord; Liquor Amnii; Fœtus, Skull, Breech, Length, Circulation, Attitude, Presentation, Position.

THE EMBEDDING OF THE OVUM.

One of the earliest effects of impregnation is the

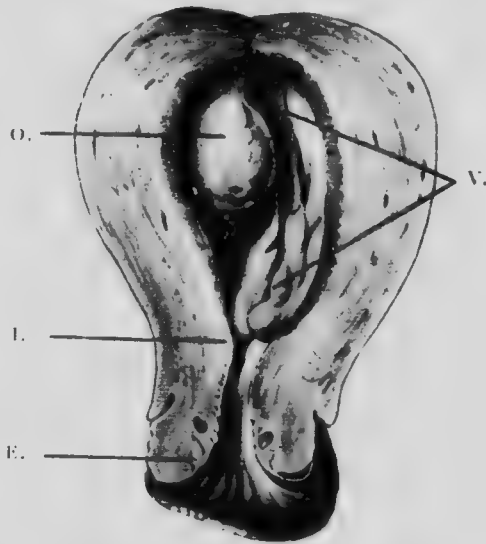


FIG. 6.—Uterus at fourth week. o. Ovum covered by decidua capsularis. v. Decidua vera. i. Internal os. e. External os. (*Bumm.*) (About one-third natural size.)

hypertrophy of the mucous membrane of the uterus,

and to this altered lining the term decidua is applied. When the fertilised ovum enters the uterus, it makes its way into the thickened mucous membrane, in which it becomes completely embedded, the minute entrance through which it effected an entrance being closed by a plug of fibrin. The manner in which the ovum effects

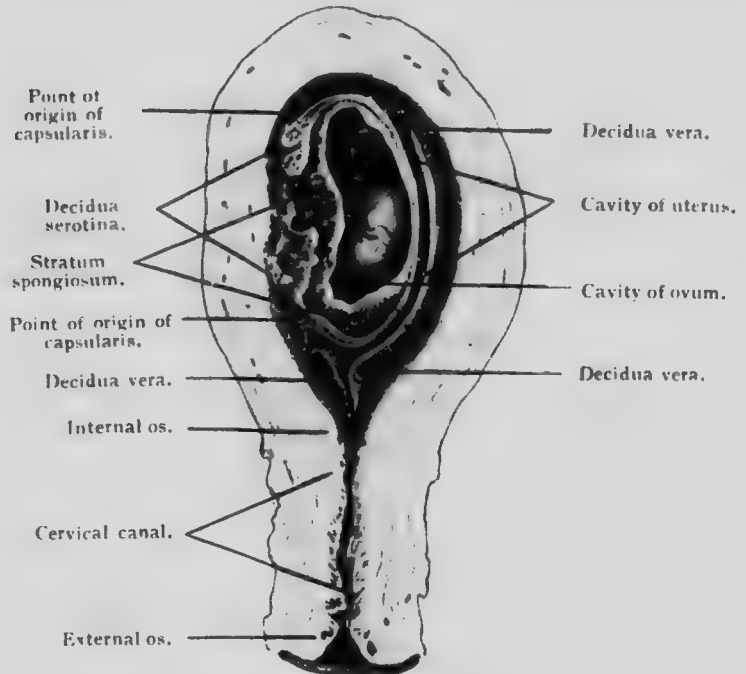


FIG. 7.—Uterus at second month of pregnancy (*Bumm*). (About two-thirds natural size.)

its entrance is still obscure, but it is usually thought to be due to a destructive action which the outer layer of epiblastic cells is said to exert upon the maternal tissues whenever it comes into contact with them (*Peters*). To this outer layer of epiblastic cells, the term *trophoblast* is usually applied.

The destructive action of the trophoblast continues for a short time after the embedding of the ovum, with

PLATE II.

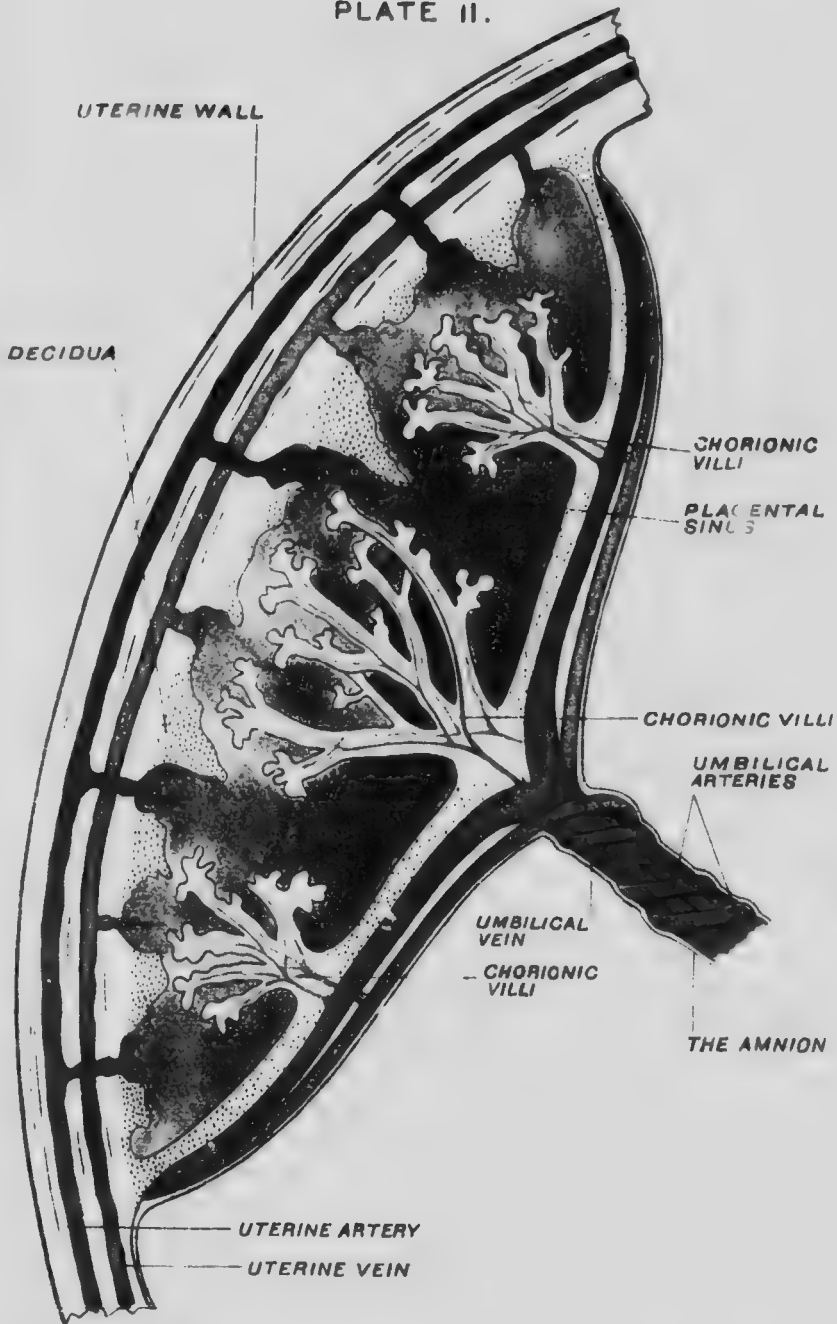


DIAGRAM TO SHOW THE NATURE OF THE PLACENTA
AND OF ITS CONNECTION TO THE UTERINE WALL.

the result that the walls of the adjacent maternal capillaries are broken down, and that maternal blood escapes into the tissues surrounding the ovum. The

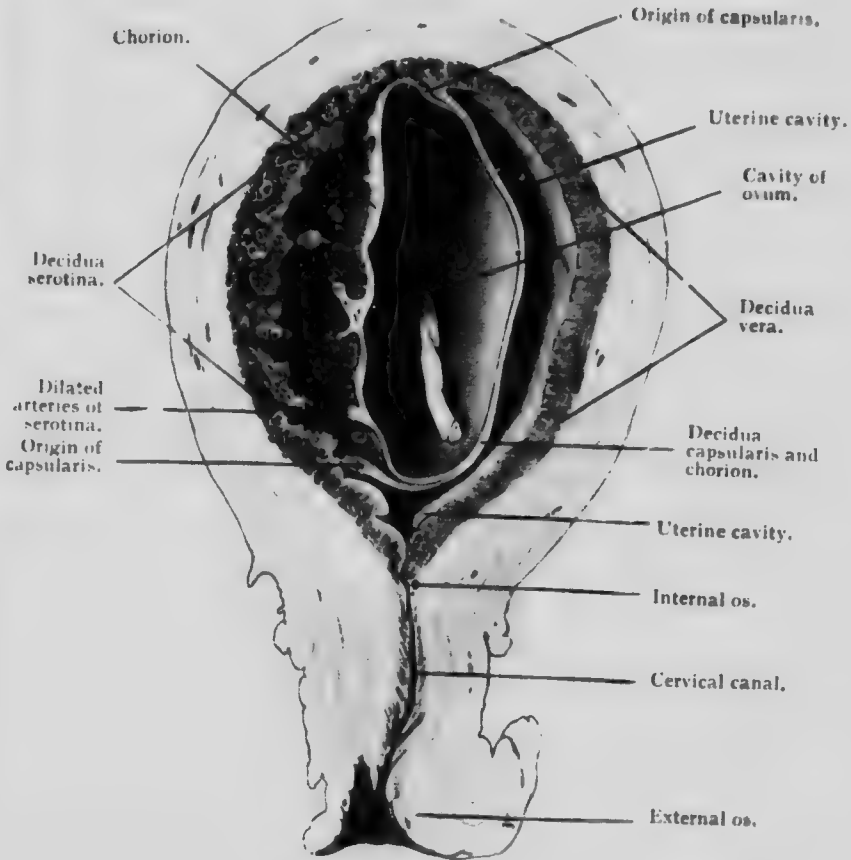


FIG. 8.—Uterus at third month (*Bumm*). About two-thirds (natural size.)

destructive action then ceases, and, instead, the ovum exerts a stimulating effect upon the endometrium, which continues to hypertrophy all over the body of the uterus.

There are three terms applied to the decidua, according to its situation with regard to the ovum. The

portion of decidua which lies directly between the ovum and the uterus is known as the *decidua basalis* or *decidua serotina*. It eventually becomes the site of the placenta. The remainder of the decidua which lines the uterus is known as the *decidua vera* (v. Figs. 7, 8). Lastly,



FIG. 9.—Uterus at tenth month (*1. umm*). (About one-fourth natural size.)

the layer of decidua which covers the ovum is known as the *decidua capsularis*, or *decidua reflexa*.

Hypertrophy of the decidua continues until about the fifth month, when it has reached its maximum thickness of three-quarters to seven-eighths of an inch. Owing to the dilatation and twisting of the uterine

glands during this period, the deeper layer of the decidua presents a spongy appearance, and on section shows a series of cavities. This layer is hence known as the *stratum spongiosum*. The glands also hypertrophy in the portion of decidua between the stratum spongiosum and the uterine cavity, but not to so great an extent, and in consequence this layer is more compact in appearance and is known as the *stratum compactum*.

After the third month, as a result of its growth, the ovum is beginning to fill the uterine cavity, and, in consequence, the decidua capsularis is coming into closer contact with the decidua vera—a process which, when complete, results in the blending of the two to form one layer and the obliteration of the decidual space which previously existed between the decidua capsularis and vera. From this on, the combined decidua thus formed atrophies, probably as a result of the increasing pressure which the growing ovum exercises upon it. Its vessels become thrombosed, and, by the time full term is reached, the decidua capsularis has practically disappeared, but the decidua vera is still present. The chief characteristics which distinguish the decidua from the endometrium may be summarised as follows (Eden):—

- (1) There is a formation of "decidual cells" from existing connective-tissue cells.
- (2) There is a hypertrophy and dilatation of the uterine glands, the deepest portion of these especially becoming widened.
- (3) The increased vascularity leads to the formation of widely dilated capillaries, or sinuses, and to interstitial hæmorrhages.
- (4) There is a partial loss of surface epithelium.
- (5) The decidua is divided into two layers, a

superficial compact layer, and a deep cavernous layer.

- (6) The decidua averages from three-quarters to seven-eighths of an inch in thickness, the endometrium averages one twenty-fifth of an inch.

THE GROWTH OF THE OVUM.

It is of importance to know the rate of growth and the chief characteristics of the ovum and of the foetus at the different months of pregnancy, and, consequently, a short note of them will be given here. For all details the student must refer to a work on embryology.

First month.—Two of the earliest ova so far described, and whose age was considered to be between eight and twelve days, had the following characteristics:—The diameter of the earlier one was one-eighth of an inch (3 mm.), of the older three-eighths (9.5 mm.); and the length of the embryos was about one-twelfth of an inch (2 mm.). During this period, the embryo is said to be nourished by osmosis. From the second week on, the nourishment contained in the umbilical vesicle is absorbed by means of the omphalo-mesenteric vessels. At the same time, the allantois is in process of making its way, with the foetal vessels, towards the chorion. At the end of the fourth week, the ovum is almost the size of a pigeon's egg, and the length of the embryo is about one-third of an inch (8.5 mm.).

Second month.—At the end of the second month the ovum is about the size of a hen's egg, that is about two and a half inches in diameter. The embryo is about one and a quarter inches (3 cm.) in length, and 240 grains (15.5 gm.) in weight. The umbilical vesicle has almost completely atrophied, and, as the allantoic

vessels have reached the chorionic villi, the embryo obtains its nourishment through them. The villi, which are subsequently to form the placenta, have begun to proliferate. Points of ossification have appeared in the clavicle and lower jaw.

Third month.—At the end of the third month, the ovum is about the size of an orange, that is three and a half to four inches (8.5—10 cm.) in diameter, while the embryo has reached a length of three to three and a half inches (7.5—8.5 cm.) and weighs about three ounces (85 gm.). The placenta is almost completely

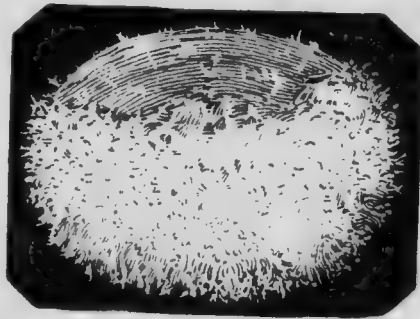


FIG. 10.—The ovum at the eighth week.

formed, and the remainder of the chorion has lost almost all its villi. The sexual organs have appeared but are not distinguishable. An appearance of nails can be detected. Points of ossification can be found in most of the bones.

Fourth month.—At the end of the fourth month, the foetus, as it is now termed, is about five inches (12.5 cm.) in length, and seven and a half ounces (212.5 gm.) in weight. The chorionic villi have entirely disappeared save in the placenta. The sexual organs are quite distinct, and the formation of *lanugo* or down has begun.

Fifth month.—At the end of the fifth month the

fœtus is about ten inches (25·5 cm.) in length and weighs about a pound (454 gm.). Hair is beginning to appear on the head, and the body is covered by lanugo. The vernix caseosa—a white greasy substance which covers the skin of the fœtus—has appeared. It is composed of desquamated epithelial scales and the secretion of the sebaceous glands. Traces of meconium appear in the intestines.

Sixth month.—At the end of the sixth month the

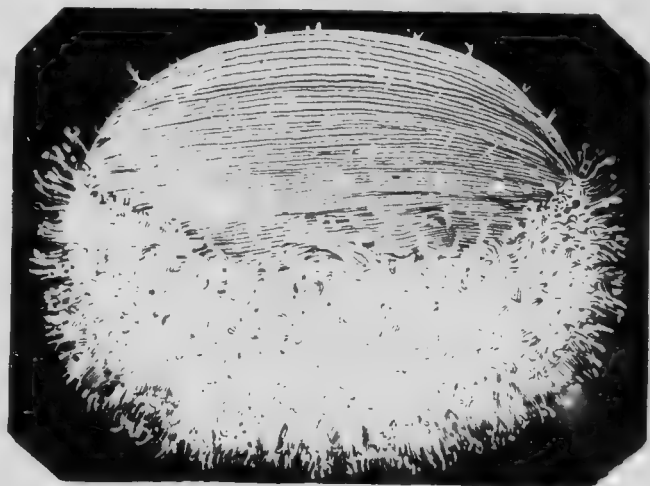


FIG. 11.—The ovum at the twelfth week.

fœtus is about a foot (30·5 cm.) in length, and weighs from two to two and a half pounds (907—1134 gm.). The eyebrows and eyelashes are beginning to form. The skin is still wrinkled, but a slight deposit of subcutaneous fat is present.

Seventh month.—At the end of the seventh month the fœtus is about fourteen inches (35·6 cm.) in length, and weighs about three pounds (1361 gm.). The pupillary membrane is still very apparent, and, in a male fœtus, the testes have reached the inguinal canals.

When born, the child gives a feeble cry. After this period, *i.e.*, after the twenty-eighth week, it is considered to be viable, *i.e.*, capable of being reared.

Eighth month.—At the end of the eighth month the fetus is sixteen to seventeen inches (43—45·5 cm.) in length, and weighs from four to four and a half pounds (1814—2040 grm.). There is an increased

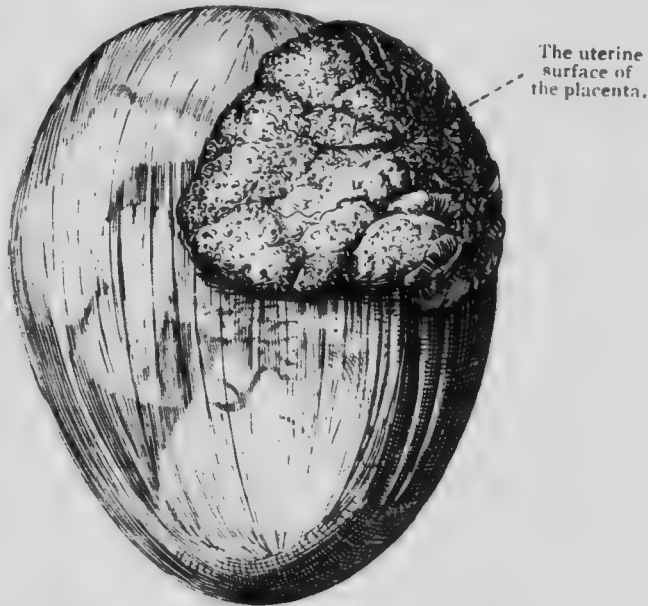


FIG. 12.—The full-term ovum, as it would appear if it was removed entire from the uterus without rupturing the membranes.

subcutaneous deposit of fat, and consequently the wrinkled appearance of the skin has almost disappeared. The pupillary membrane is disappearing and so is the lanugo.

Ninth month.—At the end of the ninth month the fetus is about eighteen inches (45·5 cm.) in length, and weighs from four and a half to five pounds (2040—2268 grm.). The previous bright red colour of the

skin has somewhat subsided. The nails have not quite reached to the ends of the fingers.

Tenth month.—During the last month various degenerative changes occur in the placenta which tend to result in a somewhat diminished blood supply to its foetal portion. The characteristics of the full term fetus will be described later (*v.* page 31).

THE FULL-TERM OVUM.

The full-term ovum is composed of the following parts : —

- I. Chorion.
- II. Amnion.
- III. Placenta.
- IV. Umbilical cord.
- V. Liquor amnii.
- VI. Fœtus.

THE CHORION.

The chorion is the term applied to the outermost covering of the ovum. From it spring the villi which grow into the uterine mucous membrane, and, consequently, upon it the fœtus depends for nutriment from the time the villi receive the fœtal vessels through the intermediary of the allantois—that is from about the fourth week—to the time of expulsion. At first, the chorion is formed by the fusion of the false amnion and the thinned-out remnant of the zona pellucida. As the allantois grows, it carries with it a vascular mesoblastic covering up to the hitherto non-vascular chorion, and this layer spreads over the chorion and converts it into a highly vascular membrane. The

vessels spread into the villi which have already grown into the decidua, and, as a result, free interchange is able to take place over the entire ovum between the foetal and maternal vascular systems. This condition continues until the end of the third month. Then the villi begin to atrophy, save in the region of the decidua basalis, and have completely disappeared by the end of the fourth month; the villi which persist form the foetal portion of the placenta, and constitute the only vascular bond of union between the foetus and the mother.

THE AMNION.

The amnion is the term applied to the smooth innermost membrane which invests the foetus. It is formed from folds of somatopleure, which at an early stage are reflected from the head and tail ends of the embryo. As the embryo sinks into the yolk, these folds grow up over its back, until they meet and coalesce with one another in the middle line in such a manner as to form two distinct membranes. The inner of these constitutes the true amnion; while the outer, the false amnion, helps to form the chorion, as has been already mentioned.

THE PLACENTA.

The placenta is the structure by means of which the foetus receives its nutriment and supply of oxygen. It is composed of two parts:—one, a foetal part, formed by the chorionic villi which persist; the other, a maternal part, formed by the decidua basalis (*v.* page 18). At full term, it is a circular, disc-shaped mass, weighing about a pound (454 grm.), thickest at the centre, where it is about an inch and a quarter in thickness, and thinning away towards the edges, which are continuous

with the thinned out and coalesced decidua and chorion. The foetal surface is smooth and concave, and is closely covered by the amnion under which run the large branches of the umbilical vessels before they dip into the substance of the placenta. The umbilical cord passes off near the centre. The uterine surface of the placenta

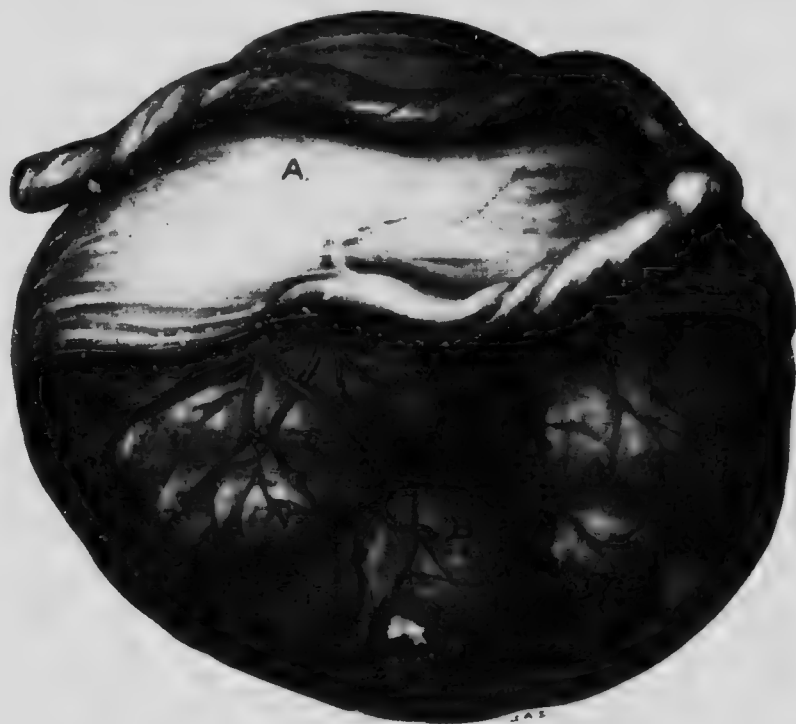


Fig. 13.—The placenta, foetal surface. A. Amnion. B. Placenta.

is incorporated with the uterine wall, from which it becomes detached at parturition by separating through the spongy tissue of which the deeper part of the decidua is formed. From without inwards the placenta is composed of the following parts :—

(1) A basal layer lying next to the spongy layer of the decidua basalis.

(2) A series of intercommunicating vascular sinuses, which constitute large flattened spaces (the intervillous spaces) bounded towards the uterine wall by the basal layer, and externally by the chorion or perhaps by a thin layer of decidua. These sinuses are supplied directly with arterial blood from the branches of the



FIG. 14.—The placenta, uterine surface. A, Amnion. C, Chorion. F, Umbilical cord.

uterine artery, which pass through the spongy stratum of the decidua basalis and through the basal stratum of the placenta to open into the sinuses without the intervention of capillaries. The fœtal villi are accordingly lying in maternal arterial blood, the circulation of which is rendered slow by the oblique manner in which the veins run

(3) Partitions of fibrous decidual tissue running from the basal layer towards the chorion, and serving to subdivide the labyrinth of vascular spaces or sinuses into a number of loculi (cotyledons). These three sets of structures—(1), (2), (3)—constitute all that remains of the compact layer of the decidua basalis.

(4) A layer of chorion and its villi. The villi hang into the loculi, which have been just described, as arborescent tufts continuous with the chorion. They are composed of three different elements. The first of these is a covering of epithelium which is derived from the trophoblast, and which consists of two layers. The outer layer is composed of multinucleated protoplasm, which has not been differentiated into cells, and is known as the syncytium. The deeper layer is composed of large and well-defined cells with oval nuclei, and is known as Langhan's layer. The second element of the villus is the connective tissue, which forms the main mass of the villus, and is derived from the foetal mesoblast. The third element consists of blood-vessels. These are the terminal branches of the umbilical vessels, and form capillary loops at the extremity of the villus. In its passage through these loops, the foetal blood comes into the most intimate relation with the maternal blood in the uterine sinuses, from which, however, it is still separated by capillary walls, the connective tissue of the villus, and the epithelial layers already mentioned. Some of the villi are attached by firm bands to the basal layer; others are attached by thinner bands to one another, and to the septal prolongations of the decidua; while still others hang free in the loculi.

(5) A layer of amnion. This forms the smooth internal covering of the placenta.

The functions of the placenta are threefold. It

serves as the respiratory organ of the foetus which through it receives the necessary supply of oxygen. It serves as an organ of nutrition, by means of which nutriment passes from the maternal to the foetal blood. And it serves as an excretory organ, by means of which the foetus gets rid of the waste products of tissue change. During the later period of intra-uterine life the last function is probably to some extent assisted by the action of the foetal kidneys. In the selection of

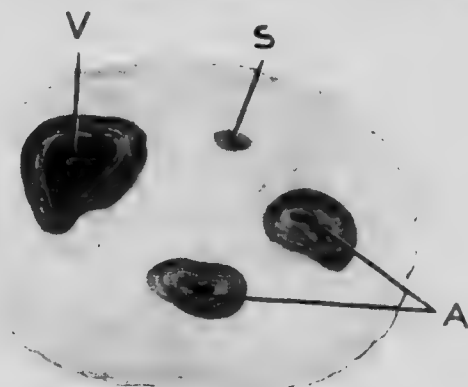


FIG. 15.—Cross-section of umbilical cord. v. Umbilical vein. A. Umbilical arteries. s. Remains of vitelline duct. ($\times 3$.)

nutriment and in the elimination of effete matter, the cells which cover the chorionic villi play, in all probability, an important part.

THE UMBILICAL CORD.

The umbilical cord, or funis, forms the connection between the foetus and the placenta. It extends from the umbilicus of the foetus to the centre of the placenta, and carries the vessels which bring foetal blood to and from the placenta. These vessels are three in number :

--two umbilical arteries which convey de-oxygenated blood from the fetus to the placenta, and one umbilical vein which conveys re-oxygenated blood from the placenta to the fetus. The vessels are surrounded by a myxomatous form of connective tissue, which is known as the Whartonian jelly, and the entire cord is invested by a covering of amnion. There are also found in the cord the remains of the allantois and of the vitelline duct. The average length of the cord is about twenty-two inches (56 cm.), but it has been found to vary between six and sixty-four inches (15—163 cm.). Its thickness is about that of the index finger. As a rule, the cord has a spiral twist of a varying number of turns, and in the large proportion of cases the twist is from right to left. The course of the umbilical vessels in the placenta has been described (*v.* page 28); their course inside the body of the fetus will be described later (*v.* page 38).

THE LIQUOR AMNII.

The liquor amnii is the fluid which fills the amniotic sac. Its normal quantity is from two to four pints (1136—2272 c.cs.), but as much as twenty pints (11,359 c.cs.) have been recorded. It is formed principally by transudation from the vessels of the mother, also by the excretion of the fetal skin and kidneys, and by transudation from the placenta and the umbilical cord.

The liquor amnii has a specific gravity of 1004 to 1025. It contains salts of potassium, sodium, calcium, magnesium, and ammonium, some albumin, and in the later months of pregnancy a small quantity of urea. The presence of the last points to the excretion of urine by the fetus.

PLATE III.

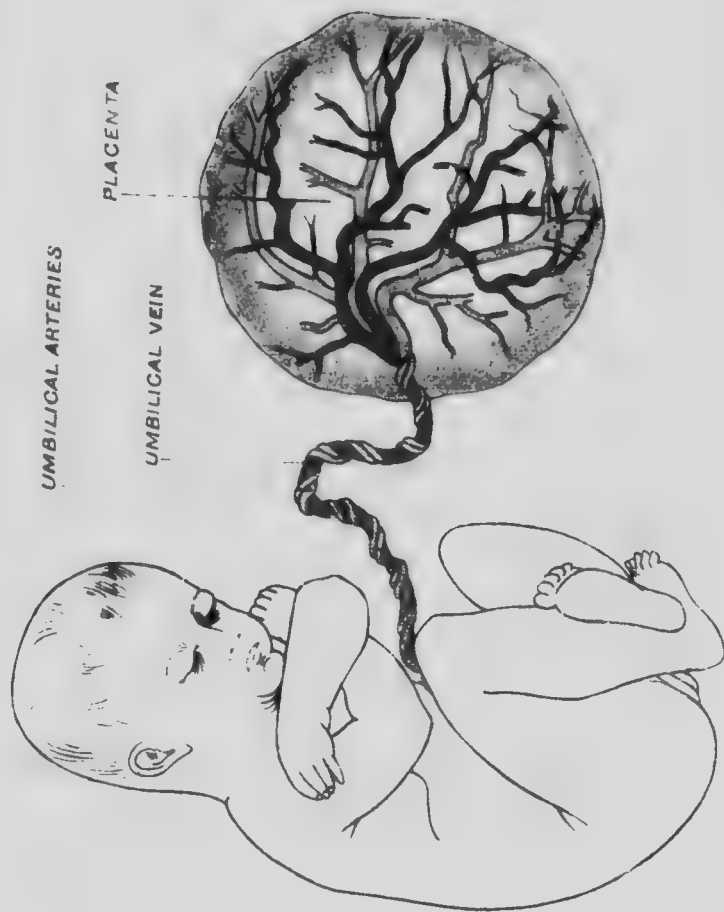


DIAGRAM OF THE FŒTUS, THE PLACENTA, AND THE UMBILICAL CORD



The liquor amnii serves to prevent undue pressure upon the fetus and umbilical cord, not only during pregnancy but also during the first stage of labour; to separate the folds of the amnion and so prevent their adhering to one another, or to the fetus; and, during labour, to dilate the cervix and to wash out the vagina.

THE FŒTUS.

At full term, the fetus is about twenty inches (51 cm.) in length, and its weight is about seven pounds (3175 grm.). The finger-nails reach beyond the ends of the fingers, the toe-nails to the ends of the toes, and the hair of the head is one or two inches in length. The lanugo has disappeared, save, perhaps on the shoulders. The child cries vigorously and moves its limbs strongly. In male infants both testicles are in the scrotum, in female the labia majora cover the labia minora. Within a few hours, the child passes urine and meconium. The latter is a dark green or almost black and slimy substance, composed of mucus from the intestines mixed with lanugo, epithelium and bile. It owes its colour to the presence of the bile.

The Fœtal Skull. The fetal skull is composed of two parts—the cranium and the face. The cranium constitutes the larger portion of the skull, and, from an obstetrical point of view, is the more important. It is composed of eight bones, and can be subdivided into a vault and a base. The vault is formed by the lateral halves of the frontal bone, the two parietal bones, the squamous portions of the two temporal bones, and the occipital portion of the occipital bone. Its most im-

portant characteristic, from an obstetrical point of view, is that these bones, instead of being more or less rigidly united to one another, are only connected by a membranous union. The result is that the vault of the cranium is essentially compressible, and so can be markedly altered in shape during its passage through the pelvis (*v.* page 134). The membranous unions between the various bones are termed *sutures*, and the meeting-place of two or more sutures is termed a *fontanelle*. The base of the skull, on the other hand, is an incompressible structure, whose dimensions cannot be altered by any force, save one which is sufficient to bring about an actual rupture of its parts. It is formed by the following bones—the orbital plates of the frontal and the cribriform plate of the ethmoid, the body and wings of the sphenoid, the petrous portions of the temporal bones, and the condylar and basilar portions of the occipital bone.

The face, owing to its smaller size, is of comparative unimportance. It is composed of fourteen bones, so united to one another that, like the base of the cranium, the structure which they form is incompressible.

Sutures.—The sutures are the intervals between the bones of the cranium. The most important are the lambdoidal, between the occipital and parietal bones; the sagittal, between the parietal bones; the coronal, between the frontal and the parietal bones; the frontal, between the lateral portions of the frontal bone; and the temporal sutures (two), between the sphenoid and the squamous portion of the temporal bone and the frontal, parietal, and occipital bones.

Fontanelles.—The fontanelles are the angular spaces formed by the intersection of the various sutures. There are two principal fontanelles (*v.* Fig. 17):—

(1) The anterior fontanelle, the large fontanelle, or the bregma, is situated at the junction of the sagittal, coronal, and frontal sutures. It is lozenge shaped, and four sutures meet to form it.

(2) The posterior fontanelle, or the small fontanelle, is situated at the junction of the lambdoidal and sagittal sutures. It is triangular, and three sutures meet to form it.

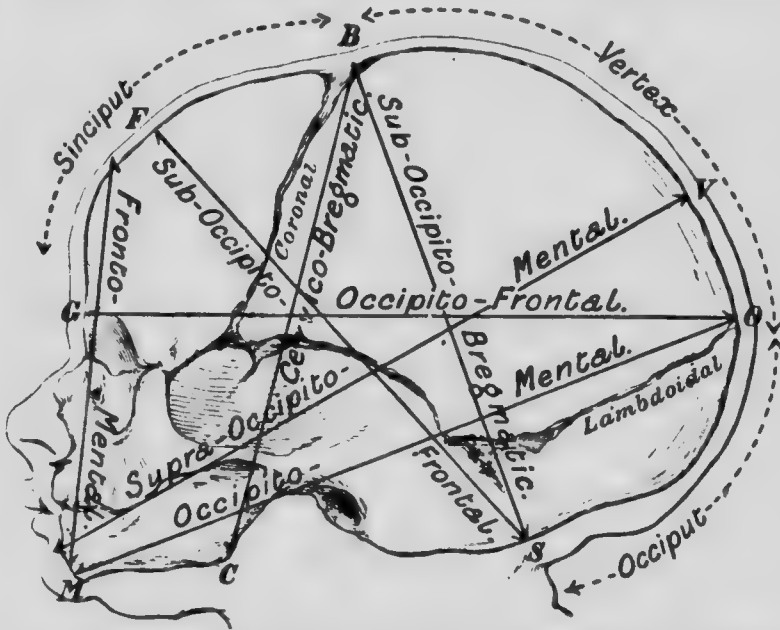


FIG. 16.—Side view of the foetal skull, showing diameters and regions.

There are also four accessory fontanelles, two at each side (v. Fig. 16):—

(1) and (2) The antero-lateral or temporal fontanelles at the junction of the coronal and temporal sutures.

(3) and (4) The postero-lateral or mastoid fontanelles at the junction of the lambdoidal and temporal sutures.

The anterior and posterior fontanelles can be dis-

tinguished, when making a vaginal examination, by comparison of their size and shape, and by the difference in the number of sutures which meet to form them.

Regions.—The skull as seen in profile is divided into the following regions (*v.* Fig. 16):—

(1) The occiput, or hind head, *i. e.* the space between a point immediately below the occipital prominence and the posterior fontanelle. It is co-terminous with the occipital bone.

(2) The vertex, *i. e.* the space between the anterior and posterior fontanelles, and bounded laterally by the prominences of the parietal bones.

(3) The sinciput, or forehead, *i. e.* the space between the anterior fontanelle and the glabella (the space between the superciliary ridges and immediately above the suture between the frontal bone and the nasal and superior maxillary bones). It is co-terminous with the frontal bone.

(4) The face, *i. e.* the space between the glabella and the junction of chin and neck. It is bounded laterally by a vertical line drawn immediately in front of the ears.

Diameters.—The diameters of the foetal skull are imaginary lines drawn through the skull from one fixed point to another, by means of which we are enabled to obtain a definite idea of the size and shape of the head. The various diameters, which are usually taken into consideration are as follows:—

(1) The sub-occipito-bregmatic diameter is the distance between the bregma, or large fontanelle, and a point immediately below the occipital prominence.

(2) The cervico-bregmatic diameter is the distance between the bregma and a point representing the junction of the neck and chin.

(3) The fronto-mental diameter is the distance between the lowest part of the chin and the highest part of the forehead.

(4) The occipito-mental diameter is the distance between the tip of the chin and the posterior fontanelle.

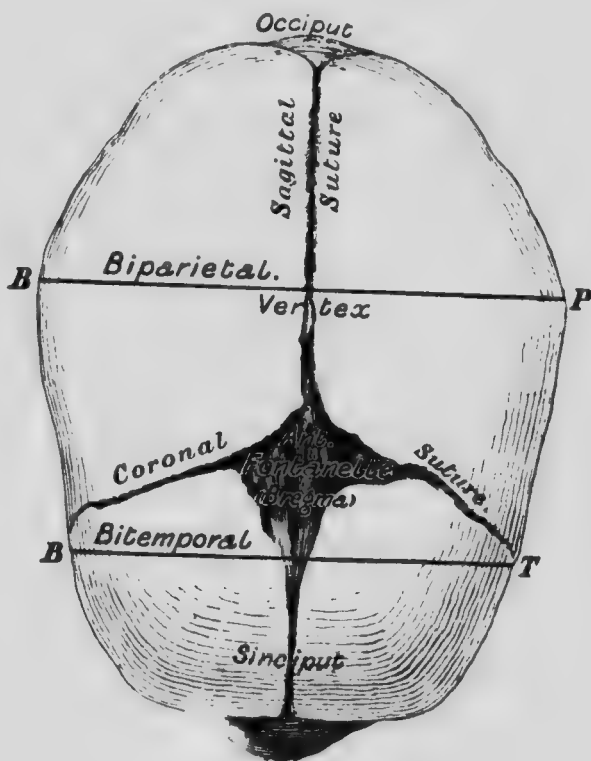


FIG. 17.— Fœtal skull as seen from above.

(5) The supra-occipito-mental diameter is the distance between the chin and the most distant part of the vertex.

(6) The occipito-frontal diameter is the distance between the glabella and the posterior fontanelle.

(7) The sub-occipito-frontal diameter is the distance

between the prominence of the forehead and a point just below the occipital prominence.

(8) The bi-parietal diameter is the distance between the parietal eminences.

(9) The bi-temporal diameter is the distance between the most widely separated points on the coronal suture.

The following are the measurements of the various diameters of the full-term foetal skull (*v.* Figs. 16 and 17):—

| | | | | |
|---------------------------------|---|---|-----------------|------------------------------|
| Sub-occipito-bregmatic diameter | . | = | $3\frac{3}{4}$ | inches (9.5 cm.). |
| Cervico-bregmatic | " | . | = | $3\frac{3}{4}$ " (9.5 "). |
| Fronto-mental | " | . | = | $3\frac{1}{2}$ " (8 "). |
| Occipito-mental | " | . | = | 5 " (12.5 "). |
| Supra-occipito-mental | | | | |
| (maximum diameter of Budin) | . | = | 5 $\frac{1}{2}$ | " (14 "). |
| Occipito-frontal diameter | . | . | = | 4 $\frac{1}{2}$ " (11.5 "). |
| Sub-occipito-frontal | " | . | = | 4 " (10 "). |
| Bi-parietal | " | . | = | $3\frac{3}{4}$ " (9.5 "). |
| Bi-temporal | " | . | = | $3\frac{1}{2}$ " (8 "). |

Circumferences.—The important circumferences of the head are as follows:—

(1) A sub-occipito-bregmatic circumference measured round the ends of the sub-occipito-bregmatic diameter. It measures $12\frac{1}{2}$ inches (32 cm.), and its maximum diameters are the sub-occipito-bregmatic diameter and the bi-parietal diameter. This is the maximum circumference which has to pass through the brim when the normal degree of flexion of the head is present.

(2) An occipito-frontal circumference measured round the ends of the occipito-frontal diameter. It measures $13\frac{3}{8}$ inches (34 cm.), and its maximum diameters are the occipito-frontal and the bi-parietal. It is the maximum circumference which has to pass through the pelvis when the head is in a position midway between flexion and extension.

(3) A supra-occipito-mental circumference — the maximum circumference of the head—measured round the ends of the supra-occipito-mental diameter. It measures $14\frac{2}{5}$ inches (36 cm.), and its greatest diameters are the supra-occipito-mental diameter and the bi-parietal diameter. It is the maximum circumference which has to pass through the pelvis when the head is semi-extended.

(4) A cervico-bregmatic circumference measured round the ends of the cervico-bregmatic diameter. It measures $12\frac{1}{2}$ inches (32 cm.), and its maximum diameters are the cervico-bregmatic and the bi-parietal diameters. It is the maximum circumference which has to pass through the pelvis when the head is fully extended.

Just as the diameters of the head can be altered in length by compression, so the circumferences can be similarly affected, and can all be more or less reduced in length. The sub-occipito-bregmatic circumference can perhaps be diminished to the greatest, and the cervico-bregmatic circumference to the least extent.

The Fœtal Trunk.—The dimensions of the fœtal trunk are not so important as are those of the skull, as they can be so reduced by compression during labour that normally they do not interfere with the passage of the fœtus. The distance between the tips of the acromion processes of the scapulæ, or the bis-acromial diameter, is the greatest transverse diameter of the trunk, and measures $4\frac{1}{5}$ inches (12 cm.). It can be reduced by pressure to $3\frac{1}{5}$ inches (9 cm.). The greatest antero-posterior diameter of the trunk, or the sterno-dorsal diameter, lies between the sternum and the spinal column, and measures $3\frac{1}{5}$ inches (9.5 cm.). It can be reduced by pressure to $3\frac{1}{5}$ inches (8 cm.).

The Fœtal Breech.—The dimensions of the breech are, like those of the trunk, of no very great practical importance. Three diameters are usually described :—

(1) The bi-trochanteric diameter, running between the trochanters and measuring $3\frac{3}{8}$ inches (9 cm.), is the largest diameter.

(2) The bis-iliac diameter, running between the most widely separated points on the iliac crests and measuring $3\frac{1}{8}$ inches (8 cm.).

(3) The sacro-iliac or antero-posterior diameter, running between the symphysis and the sacrum, and measuring $2\frac{1}{8}$ inches (5.5 cm.).

The Length of the Fœtus.—The following table shows the average length of the fœtus in centimetres at the end of the different months, and will enable the figures to be more easily remembered. At the end of each month up to the fifth, the length of the fœtus in centimetres is equal to the square of the number of the month. After the fifth month, the length of the fœtus is obtained by multiplying the number of the month by five :—

| Number of Months. | | | Length of Fœtus in Centimetres. | |
|-------------------|--------|---|---------------------------------|---------------------------|
| 1 | 1 × 1 | = | 1 | ($\frac{2}{5}$ inch). |
| 2 | 2 × 2 | = | 4 | ($1\frac{3}{5}$ inches). |
| 3 | 3 × 3 | = | 9 | ($3\frac{3}{5}$..). |
| 4 | 4 × 4 | = | 16 | ($6\frac{2}{5}$..). |
| 5 | 5 × 5 | = | 25 | (10 ..). |
| 6 | 6 × 5 | = | 30 | (12 ..). |
| 7 | 7 × 5 | = | 35 | (14 ..). |
| 8 | 8 × 5 | = | 40 | (16 ..). |
| 9 | 9 × 5 | = | 45 | (18 ..). |
| 10 | 10 × 5 | = | 50 | (20 ..). |

(Haase.)

The Fœtal Circulation.—Prior to the birth of the fœtus and the establishment of the pulmonary circula-

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PLATE IV.

VESSELS OF HEAD & ARMS

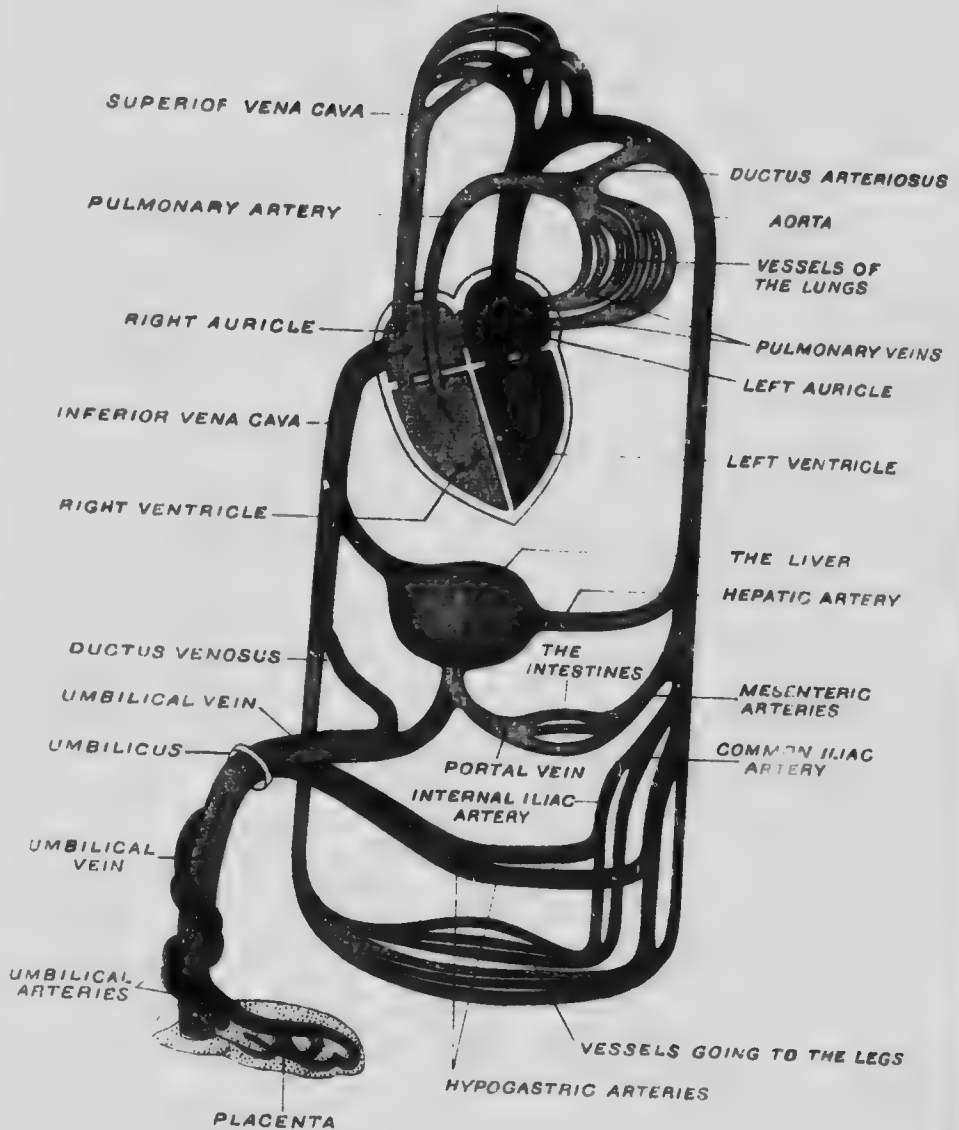


DIAGRAM OF THE FOETAL CIRCULATION.

tion, the course which the blood takes from the fetal organ of respiration, *i.e.* the placenta, through the fetus and back to be re-purified is as follows (*v.* Plate IV) :

The purified blood leaves the placenta by means of the umbilical vein, and enters the body of the fetus at the umbilicus. It then divides, at the transverse fissure of the liver, into two streams. The larger stream flows through the ductus venosus into the inferior vena cava, where it meets the impure blood returning from the lower half of the body ; the smaller stream flows into the portal vein, thence through the liver, and thence through the hepatic veins, with the addition of the blood which reached the liver through the hepatic artery, also into the inferior vena cava. Accordingly, the inferior vena cava pours into the right auricle, pure blood from the placenta, and impure blood from the liver and lower half of the body.

From the right auricle, this stream is believed to be directed by the Eustachian valve through the foramen ovale into the left auricle, without mingling to any great extent with the impure blood which enters the right auricle through the superior vena cava. In the left auricle, it is rendered more impure by the addition of the small quantity of blood which returns from the lungs through the pulmonary veins.

From the left auricle, the mixed stream flows into the left ventricle, and thence into the aorta. From the aorta, a small part of the stream flows to the head and arms, to be returned subsequently through the superior vena cava into the right auricle, while the main stream flows into the descending aorta, and there meets the impure blood which is poured into the aorta, from the pulmonary artery, through the ductus arteriosus. Thence, this mixed blood flows to the lower portion of the body, whence it in part returns to the inferior vena cava,

either directly or through the intermediary of the liver, and in part flows through the hypogastric arteries to the umbilicus, and thence through the umbilical arteries to the placenta.

The course of the blood which left the arch of the aorta, supplied the head and arms, and returned to the right auricle through the superior vena cava, has still to be followed. In the right auricle, this stream of impure blood receives a slight addition of pure blood. The mixed stream then flows into the right ventricle, and thence into the pulmonary artery. From the pulmonary artery by far the greater part passes, through the ductus arteriosus, into the descending aorta, where it meets the blood from the left ventricle as has been described. The smaller portion flows through the pulmonary artery to the lungs, whence it returns through the pulmonary veins to the left auricle, to unite with the blood that came into the heart through the inferior vena cava.

At the birth of the child, and the establishment of respiration, modifications occur in the heart and vessels, which result in the establishment of the pulmonary circulation, properly so called (*v. Plate V*). These changes are more immediately determined by the inflation of the lungs with air during the first inspiration, by the accompanying rapid increase of blood in the pulmonary blood-vessels, and by the interruption to the passage of blood through the placental circulation. They are finally completed by the obliteration of the ductus arteriosus and the hypogastric arteries, by the cessation of the passage of blood through the foramen ovale, and by the obliteration of the umbilical vein and of the ductus venosus. The lumen of the hypogastric arteries is usually completely obliterated by the third or fourth day after birth; the ductus arteriosus is usually

PLATE V.

VESSELS OF HEAD & ARMS

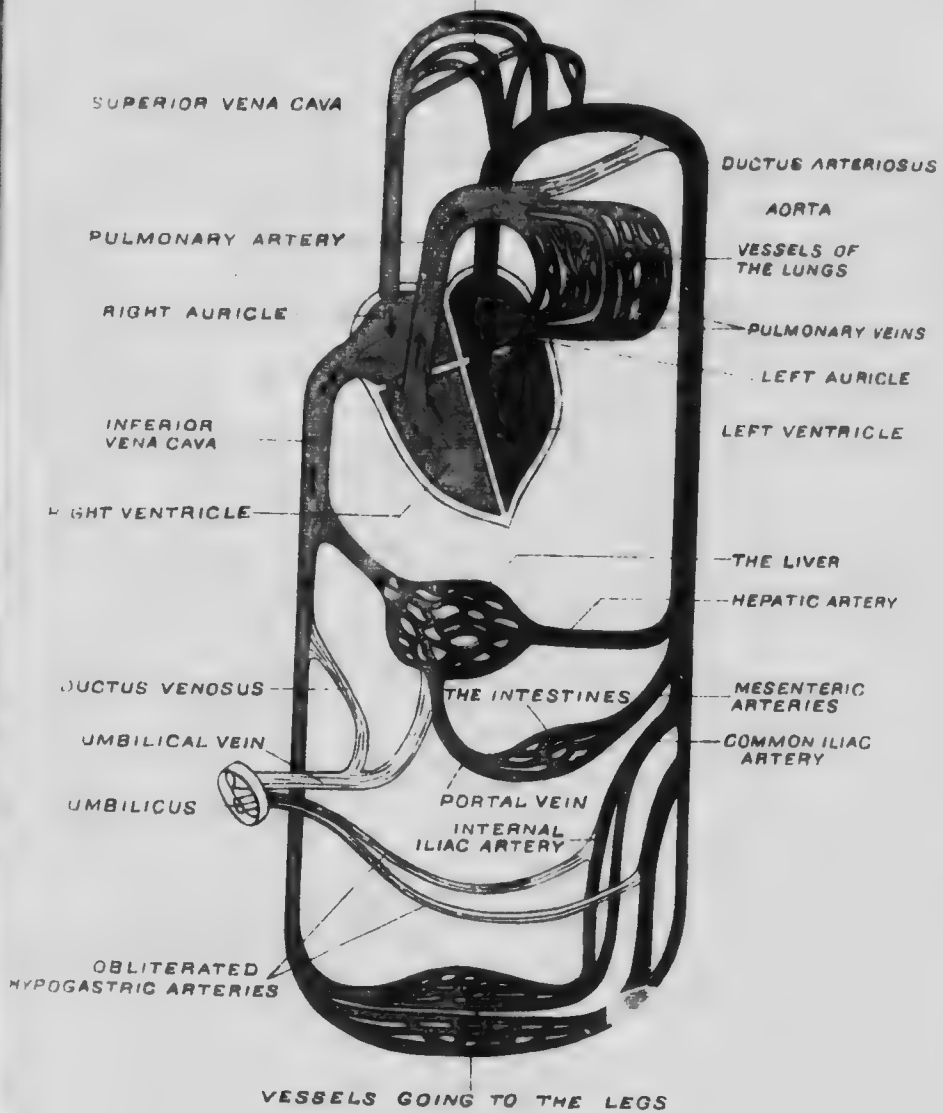


DIAGRAM OF THE ADULT CIRCULATION.

closed after the eighth or tenth day, and the umbilical vein and ductus venosus by the sixth or seventh day. Although blood ceases to pass through the foramen ovale at the moment of birth, in all probability the opening does not become completely obliterated until some time in the latter half of the first year.

Attitude.—The attitude, or posture, which the fetus assumes in the uterus is one which reduces it to the smallest possible size. The head is flexed on the chest, the spine curved with the convexity upwards, the upper limbs crossed on the chest, the lower limbs flexed on the abdomen, and the legs flexed on the thighs and crossed. The fetus thus assumes an ovoid shape, having two poles, the pelvic and the cephalic. The pelvic pole, that is the breech and lower extremities, is larger than the cephalic pole; and the distance between the two poles is the longer axis of the ovoid (v. Fig. 18).

Presentation.—The presentation is the term applied to that part of the fetus which is engaged, or is tending to become engaged, in the pelvic cavity. Theoretically almost any part of the foetal body can present, but as a matter of fact in a large majority of cases, one or other pole does so. The cephalic pole presents far the more frequently; indeed, counting full-term labours alone, the fetus is born with the head presenting in 97 per cent. of cases. The shape of the uterine cavity makes it easy to understand why the child should present by one or other pole; but why there should be such an overwhelming proportion of head presentations is not at first so obvious. Three factors unite to account for it.

1. In the earlier months of pregnancy, the uterus

grows more rapidly than the fetus, and, consequently, the latter is free to move about and assume any position. As pregnancy advances, the fetus grows more rapidly than the uterus; and, as it begins to occupy the entire uterus, it is guided by the pressure



FIG. 18.—Diagram showing the adaptation of the fetus to the uterus in a vertex presentation.

of the uterine walls until its long axis corresponds with the long axis of the uterus,—that is, until the fetus is lying with one pole at the fundus and the other in the lower uterine segment. Further, since the breech and the lower limbs together are more bulky than the head, and since the uterine cavity is also

of an ovoid shape whose larger end is uppermost, the pelvic pole is guided to the fundus, and the head is guided to the lower uterine segment (Cazeaux). If this is so, we should expect malpresentations in cases in which the uterus has lost its shape, and, as a matter of fact, excess of liquor amnii, multiple pregnancies, pluriparous uteri, contracted pelves, uterine tumours, all favour the occurrence of malpresentations by destroying the natural shape of the uterus.

(2) Another factor which may assist in determining cephalic presentations is gravitation. If a foetus is immersed in a saline solution of the same specific gravity as the liquor amnii, it floats on its back, its head slightly lower than its breech, and its right shoulder lower than its left.

(3) A third factor which may assist in the determining of cephalic presentations, is the active movement of the foetal lower limbs. These movements meet with greater resistance when the breech lies in the lower portion of the uterus, and, consequently, their tendency is to drive the breech upwards towards the fundus. As soon as this occurs, opposition to the movements is lessened owing to the increased space afforded by the larger end of the uterine cavity, and hence there is no tendency to a further change of presentation.

The various presentations are classified as follows :—

(A) Cephalic presentations, *i. e.* presentations of the head, occurring in 96·59 per cent. of cases. In this group are included the following :—

(1) Vertex presentation, *i. e.* when the foetus assumes its normal attitude and the vertex lies lowest. It occurs in 95·88 per cent. of all

deliveries (in this figure, anterior and posterior fontanelle presentations are included).

- (2) Face presentation, *i. e.* the resultant presentation after full extension of the head. It occurs in 0.55 per cent. of cases.
- (3) Brow presentation, *i. e.* the resultant presentation when the head lies midway between

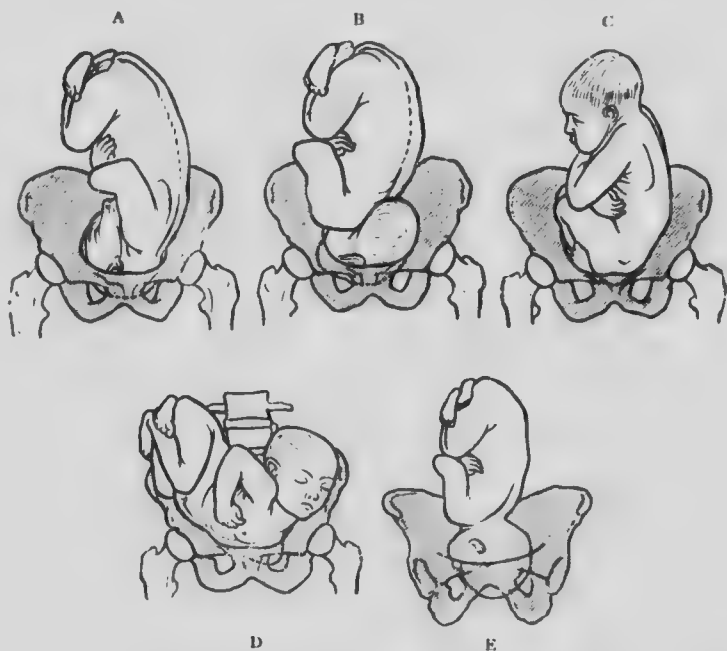


FIG. 19.—Diagram of the principal presentations. A. Vertex. B. Face. C. Pelvic. D. Transverse. E. Brow.

flexion and extension, and the forehead lies lowest. It occurs in 0.16 per cent. of cases.

- (4) Anterior fontanelle presentation, *i. e.* a stage between a vertex and a brow presentation, in which the anterior fontanelle lies lowest.
- (5) Posterior fontanelle presentation, *i. e.* the resultant presentation after full flexion of the

head, in which the posterior fontanelle lies lowest.

(B) Pelvic presentations, *i. e.* presentations of the breech or lower extremities of the fœtus, occurring in 3·08 per cent. They are divided into—

- (1) Complete pelvic presentation, in which the breech and feet descend together.
- (2) Incomplete pelvic presentation, in which (*a*) the breech descends alone, (*b*) one or both knees, (*c*) one or both feet descend first.

(C) Transverse presentation, in which some portion of the trunk, usually a shoulder, presents, occurring in 0·33 per cent.

We may tabulate the presentations and their frequency as follows :—

| | | | | | |
|--|---|---|---|------|---|
| Vertex presentation (including fontanelle presentations) occurs in 95·88 per cent. of all cases. | | | | | |
| Face | " | " | " | 0·55 | " |
| Brow | " | " | " | 0·16 | " |
| Breech | " | " | " | 3·08 | " |
| Transverse | " | " | " | 0·33 | " |

Position.—By position, we mean the relation between some fixed part or parts of the fœtus and the middle line of the mother. In polar presentations, *i. e.* cephalic or pelvic presentations, the back is the fixed part chosen and we recognise four positions, according as it is turned towards the left or the right side of the mother, and as it is turned forwards or backwards. In transverse presentation, the back and the head are chosen as the fixed parts, and we again recognise four positions, according as the back is turned forwards or backwards,

and as the head is turned towards the left or the right side of the mother.

In polar presentations, when the back is turned to the left of the middle line and is directed forwards, the fetus is said to lie in the first position ; when the back is turned to the right of the middle line and is directed forwards, in the second position ; when the back is turned to the right of the middle line and is directed backwards, in the third position ; and when the back is turned to the left of the middle line and is directed backwards, in the fourth position.

In transverse presentation, when the back is turned forwards, with the head on the left of the middle line, the fetus is said to lie in the first position ; when the back is turned forwards, with the head on the right of the middle line, in the second position ; when the back is turned backwards, with the head on the right of the middle line, in the third position ; when the back is turned backwards, with the head on the left of the middle line, in the fourth position.

In all polar presentations the first position is the most common. Three factors probably unite to cause this :—

(1) The right oblique diameter of the pelvis is the longer of the two, inasmuch as the left oblique is shortened by the presence of the rectum and the pelvic colon. The antero-posterior diameters of the foetal head are longer than the transverse diameters. Consequently the head fits best into the pelvis when its antero-posterior diameters correspond with the right oblique diameters of the pelvis.

(2) The anterior half of the uterine cavity lies lower than the posterior half when the woman is standing, and the uterus tends to fall over slightly to the right side. The lowest part is consequently in the right iliac

fossa. As a result, the part of the fœtus which sinks lowest will lie in this region. This, as has been shown, is the head, neck, and right shoulder. Consequently the tendency of gravitation, when the woman is upright, is to keep the head over the pelvic brim, the back in front, and the right shoulder on the right side of the uterus.

(3) The antero-posterior diameters of the fœtal ovoid are longer than the transverse diameters. Further, the transverse diameters of the uterus are longer than the antero-posterior diameters. Owing to the dextro-torsion of the pregnant uterus, its transverse diameters correspond to the right oblique diameter of the pelvis, and, as the fœtus tends to accommodate itself to these long diameters of the uterus, it lies with its antero-posterior diameter corresponding to the right oblique diameter of the pelvis.

CHAPTER IV.

OBSTETRICAL DIAGNOSIS.

Methods of Examination: History of the Patient, Inspection: Abdominal Palpation, Vaginal Examination, Auscultation, Pelvimetry.

THE various methods by which we can obtain information regarding the patient during pregnancy, labour, and the puerperium, are as follows :—

- I. Questioning with the object of eliciting her previous medical history and symptoms.
- II. Inspection.
- III. Abdominal palpation.
- IV. Vaginal examination.
- V. Auscultation.
- VI. Pelvimetry.

THE HISTORY OF THE PATIENT.

The information, which must be elicited regarding the history and symptoms of the patient, differs, to some extent, according as we are dealing with a patient during pregnancy or during labour.

During pregnancy the following information must be obtained :—

- (1) Date of last menstruation ; date of quickening ; date at which the movements of the fœtus were last felt.

(2) Changes noticed in the size and appearance of the abdomen and breasts.

(3) Condition of the general health previous to pregnancy and during pregnancy.

(4) Number and nature of previous pregnancies, if any.

(5) Nature of previous labours. Are the children alive or dead? If dead, did they die prior to or during labour or after delivery, and what was the cause of death?

(6) Condition of urinary system. Amount of urine passed daily. Presence of any urinary trouble, such as too frequent micturition.

(7) Condition of digestive system. Presence of nausea, vomiting, loss of appetite, indigestion, constipation, diarrhoea.

(8) History of any organic disease.

(9) Presence of any abnormal condition of the genital organs—*e.g.*, vaginal discharge, pruritus vulvæ, prolapse of the vagina, etc.

During labour the following information must also be obtained :—

(1) When did the uterine contractions begin?

(2) Have the membranes ruptured? If so, how long?

(3) Is there any inclination to "bear down"—*i.e.*, to exert the voluntary muscles of labour?

INSPECTION.

A general inspection of the patient is made with the object of determining the presence of the usual appearances of pregnancy, of any obvious signs of ill-health, of abdominal tumours, or of any marked deformity which could give rise to difficulties during labour.

The usual changes which occur during pregnancy are present to a varying degree in correspondence with the period of pregnancy, and are as follows :—

(1) The face :—Alterations in complexion and aspect.

(2) The breasts :—Alterations in size, shape, and appearance.

(3) The abdomen :—Alterations in size, shape, and appearance.

(4) The vulva and vagina :—Alterations in appearance.

The nature of these alterations will be dealt with later (*v.* page 81).

An obvious indication of ill-health is furnished by an appearance of undue emaciation or cachexia, or by the presence of anæmia, œdema, jaundice, or glandular enlargements.

The presence of abdominal tumours may be suggested by the enlargement of the abdomen out of proportion to the age of the pregnancy, and perhaps by the irregular and asymmetrical character of the enlargement.

The existence of marked pelvic deformity may be suggested by the following conditions :—

(1) Undue prominence of the abdomen, or a pendulous abdomen.

(2) Diminutive stature.

(3) Curvature of the spine—kyphosis, lordosis, or scoliosis.

(4) Crooked legs, legs of unequal length, or absence of one leg.

ABDOMINAL PALPATION.

Abdominal palpation is by far the safest method of

examining a pregnant woman, and it yields most important information. It is carried out as follows.

Place the patient flat upon her back, with her pelvis straight and her legs extended and slightly separated, and then sit down at her right side about the level of the pelvis and facing her head. Next, gently lay both hands flat upon the abdomen about the level of the umbilicus, and by rotating them endeavour to feel if the abdomen contains a tumour. The hands should be warm, and we must be very careful to avoid undue pressure, which makes the patient contract her abdominal muscles, and so renders further palpation impossible. Avoid also lifting the finger-tips off the abdomen, as this also causes contractions of the recti. Move the fingers and hands gently from place to place without lifting them. If the pregnant uterus is felt, ascertain the height of the fundus in order to determine how far pregnancy has advanced (*cf.* page 83). At the same time, observe whether the surface of the uterus is smooth and regular in conformation, as this shows that there are no sub-peritoneal tumours, such as myomata; also notice whether there is any enlarged organ or tumour in the abdomen except the uterus. Next, palpate the uterine contents in order to determine with what degree of clearness and definition they can be felt, and whether there is anything except the uterine and abdominal walls and the normal amount of liquor amnii between the fingers and them. This enables us to judge whether the quantity of liquor amnii is excessive, and whether there are any interstitial or subserous tumours of the uterus. While this is being done, notice that the uterus is contracting intermittently, and ascertain from the patient whether the contractions are, or are not, accompanied by pain, as this assists in determining whether she is or is not in labour.

In order to determine the presentation and position of the fetus, the uterus must be palpated in a special manner by four distinct "grips," or methods of applying the hands. For the first three grips, our position with regard to the patient is similar to that which has just been described ; for the last grip our position must be altered. The first grip is termed the *fundal grip*.



FIG. 20.—Abdominal palpation. The fundal grip.

To make it, lay both hands gently flat upon the fundus of the uterus, and feel what is lying there (*v.* Fig. 20). As a rule, one pole of the fetus will be felt under the hands, either in the middle line or deflected to the left or right. Attention to the following points will enable us to decide which pole it is :

(1) *Its mobility.* When the membranes are intact, the head can be made, by means of a sudden push with the fingers, to float about from side to side, *i. e.* ballote,

independently of the body of the fetus, owing to its cervical articulation. The breech, on the other hand can only be moved from side to side *en bloc* with the back.

(2) *Its shape.* The head is smooth and round, and separated from the body by a transverse groove—the groove of the neck. The breech is not quite so smooth



FIG. 21.—Abdominal palpation. The umbilical grip.

and round, but the difference in this respect is not very great. There is no groove to be felt between it and the body, and the feet may be felt lying beside it.

(3) *Its consistency.* The head is considerably harder than is the breech, but both the consistency and the shape of the fundal pole of the fetus are often much obscured by the placenta.

Having palpated the fundus, move the hands gently downwards until the level of the umbilicus is reached,

and there make the *umbilical grip* (*v.* Fig. 21). By rotating the hands, the nature of the fetal parts at this level can be ascertained. Either the ~~resisting~~ plane of the back will be felt, or the irregular outlines of the limbs. In polar and oblique presentations, the back lies more or less obliquely in the long axis of the uterus. In true transverse presentations, it lies horizontally, but this condition is very rare. If the abdominal

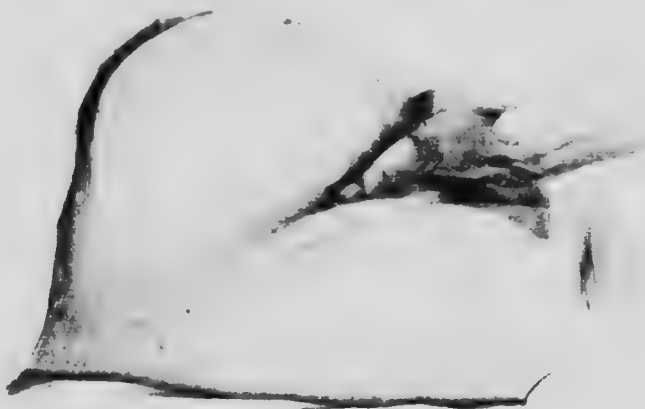


FIG. 22. — Abdominal palpation. Pawlic's grip.

walls are very thick, and there is a consequent difficulty in feeling the fetal back, lay the hands flat on each side of the uterus and move them synchronously, first to one side and then to the other, making the uterine contents move with them. By this means, one notices that there is a greater resistance offered to one hand than to the other. This greater resistance is on the side at which the back is.

The next two grips are *pelvic grips*. The first, *Pawlic's grip*, is made with the right hand only (*v.* Fig.

22). Sink the fingers into the false pelvis over the centre of Poupart's ligament on the left side, and the thumb into the corresponding point on the right, and then approximate them. By this grip we can discover whether the pelvic brim is occupied by the foetal part or is empty, and what the foetal part, if any, is. If the patient is not in labour, and the presenting part fills the



Fig. 23.—Abdominal palpation. The second pelvic grip.

pelvic brim, it can only be a vertex (Pinard). If the presenting part is freely movable, we can determine whether it is a head or a breech, in the same manner as if it was at the fundus. If the patient is in labour, and the presenting part is fixed, we feel the outline of the chin or occiput and the groove of the neck, in the case of the head; while the breech is more irregular and larger, and the lower limbs can be felt near it. The different presentations of the head (vertex, face, brow)

can be determined chiefly by noting the relationship, in point of height above the pelvic brim, between the occiput, *i.e.* the portion of the cephalic tumour which occupies the pelvis at the same side as that on which the back is, and the chin. If the chin lies higher than the occiput, it is a vertex presentation ; if it lies lower,



FIG. 24.—Relative position of the chin and the occiput in vertex presentation, as ascertained by abdominal palpation.

it is a face ; and if both lie at the same level, it is a brow (*v.* Figs. 24–26).

These three grips are usually sufficient to tell all that is required. If, however, the presenting part has sunk deeply into the brim, another form of pelvic grip, the fourth grip, will be necessary in order to feel it. To practise this grip two hands are required ; and, in place of facing the patient's head, we turn so as to face her

feet (*v.* Fig. 23). Then, sink the tips of the fingers of the right hand into the true pelvis at one side, and the tips of the fingers of the left hand similarly at the other side. By this means, the extent that the presenting part has descended can be estimated.

To make more clear the method of palpation, we shall describe a case in which the child is lying in the



FIG. 25.—Relative position of the chin and the occiput in brow presentation, as ascertained by abdominal palpation.

first vertex position. On making the *fundal grip*, a large, firm, and rounded tumour is felt at the fundus, lying slightly to the right of the middle line, and proceeding from it is felt the back of the child on the left, and perhaps the limbs on the right. There is no groove between the round tumour and the back, and on moving the tumour, it moves *en bloc* with the back. It must therefore be the breech. By the *umbilical grip*, the back

is felt on the left, and, on moving the hands laterally, the greatest resistance is felt upon that side. By *Pawlic's grip*, another hard rounded tumour is felt in the pelvic brim. It is hard and slightly smaller and rounder than the fundal tumour, and between it and the back is a groove running obliquely—the groove of the neck. This groove, and also the tumour, lie higher above the pelvic brim upon the right side than upon



FIG. 26. —Relative position of the chin and the occiput in face presentation, as ascertained by abdominal palpation.

the left. If the tumour is not fixed it can be moved about independently of the back. These points distinguish it as a head; and the fact that the tumour is higher above the pelvic brim on the right than on the left, shows that the chin is higher than the occiput, and therefore that the vertex is presenting.

The presentation and position of the foetus having been determined, the next point is to ascertain the

relationship of the presenting part to the pelvic brim. Accordingly we must endeavour to answer the following questions :—

- (1) Is the presenting part fixed ?
- (2) How deeply has it entered the pelvic cavity ?

1) *Is the presenting part fixed?*—The answer to this question gives most important information, when it is taken in connection with the number of children the patient has had and the duration of labour. It can be determined by grasping the presenting part as in Pawlic's grip (v. Fig. 22), and endeavouring to move it laterally. If this can be done, the presenting part is not fixed. As a general rule we may consider that in normal cases, in primiparæ, the head is fixed during the last three or four weeks of pregnancy, while in multiparæ, it may not fix until the beginning of labour. There are several conditions which tend to prevent the fixation of the head:—

- (a) Contracted pelvis, or tumours about the brim of the pelvis.
- (b) Pendulous abdomen, or obliquity of the uterus.
- (c) Hydramnios.
- (d) Multiple pregnancy.
- (e) Placenta prævia.
- (f) Malpresentations of the head.
- (g) Hydrocephalic head.

The diagnosis between these various conditions must be made by the further examination of the patient. It is, however, well to accept as a general rule that, when the head ballottes freely above the brim at a time at which it should be fixed, pelvic contraction is the probable cause.

- 2) *How deeply has the presenting part entered the*

pelvic cavity?—The answer to this question tells us the progress labour is making, and indeed this fact can best be determined by noting the descent of the presenting part. In the early stages of labour, the height of the chin above the pelvic brim can be measured in finger-breadths. As labour advances, the chin approaches the level of the pelvic brim, and then sinks below it. The rate of advance can then be determined by the fourth grip. This is a more reliable method of determining the advance of the head than is a vaginal examination. In all cases of delayed labour with strong uterine contractions, the caput succedaneum hourly increases in size and bulges downwards more and more; consequently, we may easily be led, when making a vaginal examination, to attribute the diminished distance between the caput and the perineum to the descent of the presenting part, instead of, as may be the case, to the increasing size of the caput.

The final points to be determined by abdominal palpation are:—

- (1) The extent to which the uterus has contracted down upon the ovum.
- (2) The height of the retraction ring.
- (3) The condition of the round ligaments.
- (4) The character of the uterine contractions.

(1) *The extent to which the uterus has contracted down on the ovum.*—This is determined by noting the degree of mobility of the fœtus inside the uterus.

(2) *The position of the retraction ring.*—The retraction ring is not noticed in normal labours, as it rises only very slightly above the symphysis. In delayed labour, however, the ring is always rising higher into the abdomen, according as the muscle fibres retract and the upper uterine segment thickens (v. page 124). It

this ring rises more than an inch and a half above the symphysis, it constitutes one of the signs of threatened rupture of the uterus, and is an indication for immediate delivery. It has to be distinguished from the condition present in the case of a distended bladder, as the depression which is found above the latter is not unlike the retraction ring. A distended bladder may usually be recognised by obtaining fluctuation in it, and, if a catheter is passed, the depression disappears. Also, the depression at the top of a full bladder lies horizontally, or is crescentic with the concavity downwards, while the depression over the retraction ring runs obliquely from side to side, as the uterus usually retracts more rapidly over the back than over the limbs.

(3) *The condition of the round ligaments.*—By moving the fingers gently across the body of the uterus, the left round ligament can readily be felt as a thick cord running upwards over the surface of the uterus. The right ligament, as a rule, is not felt, owing to the partial dextro-rotation of the uterus round a vertical axis. It is important to note whether the ligament has become tense, and the degree to which it stands out from the uterus (*v.* page 117).

(4) *The character of the uterine contractions.*—By laying the hand flat upon the uterus, the intensity and duration of the uterine contractions can be appreciated. Normally, they should be intermittent, but, if labour is unduly prolonged, they become continuous or tonic.

The estimation of these four points enables us to recognise the effect that labour has had upon the muscle fibres of the uterus, and consequently to know with a greater or less degree of certainty whether the patient has been too long in labour or not (*v.* page 137).

In certain conditions of the patient it may be impossible to obtain much information from abdominal palpation:—if she will not allow her abdominal muscles to relax; if there is very little liquor amnii, or if the liquor amnii has escaped for a long time, and

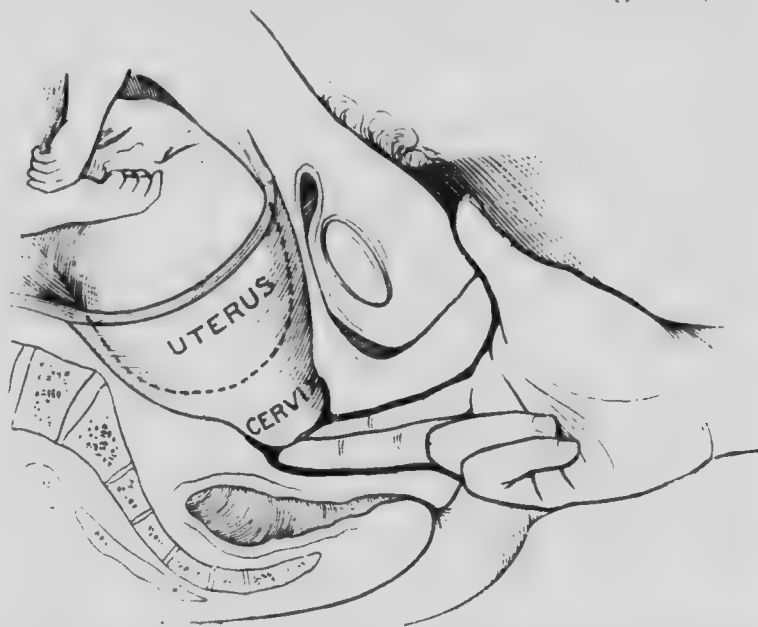


FIG. 27.—The cervix as felt by vaginal examination at the beginning of labour. (A large part of the wall of the uterus has been taken away in order that the position of the foetal head may be seen.)

the uterus is contracted down upon the foetus; and if there is a great excess of liquor amnii—hydramnios.

VAGINAL EXAMINATION.

The next method of examining a patient is *per vaginam*, and the following is the manner in which such an examination is carried out:—The external genitals of the patient are first carefully washed with soap and water, and then sponged with lysol or corrosive sub-

limate solution (*v.* page 5). The examiner washes and disinfects his hands (*v.* page 4), and puts on rubber gloves. The patient then lies on the left side, her buttocks well over the edge of the couch, and the thighs flexed to a right angle. The examiner, standing beside the couch, with the fingers of his left hand raises the right labium majus so as to expose the vaginal orifice, and then passes the index and middle fingers of his right hand into the vagina and upwards to the cervix. The first points to be determined are the extent to which the cervix has been taken up and the size of the uterine orifice, or the size of the "os" as it is commonly termed. The extent to which the cervix has been taken up is determined by noting the thickness of cervical tissue which lies between the examining finger and the presenting part. In doing this, due allowance must be made for the softness of the cervix—a condition which renders it difficult to appreciate the exact thickness of the cervical tissue. The size of the uterine orifice is determined by sweeping the fingers round its edges. It is important to remember that it is sometimes hard to distinguish in a primipara between a cervix which is fully taken up, but in which the uterine orifice is undilated, and a full dilatation of the uterine orifice. The reason of this is that in the former case, the cervical tissue is so thinned that it is as easy to feel the outlines of the presenting part through it as if there was nothing intervening between the fingers and the presenting part. Hence, it is always important to feel carefully for the edges of the os. If this is done, and the edges cannot be felt, it is certain that the uterine orifice is fully dilated.

As soon as the condition of the cervix has been determined, try to push the presenting part upwards, in order to ascertain if it is fixed or not. If it is not

fixed, palpate the edges of the brim to ascertain the presence or absence of a recognisable deformity. At the same time, ascertain whether the membranes are ruptured or not. Then, examine the presenting part, ascertain its nature, and note how far it has descended into the pelvis, and whether it is fixed or can be pushed upwards.

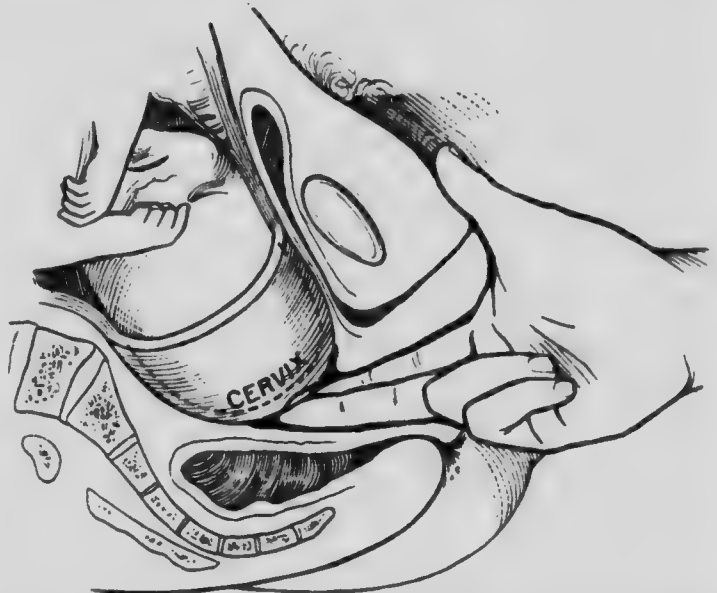


FIG. 28.—The cervix and presenting part as felt by vaginal examination after the cervix has been taken up into the lower uterine segment.

The presenting part can be determined by noting its size, shape, and characteristics. A vertex and a breech both feel to be firm rounded tumours; but, on the vertex, which is more regular in outline, are felt the sutures and fontanelles; on the breech, the anus, the tip of the coccyx, and the two tubera ischii. The face at the beginning of labour is very irregular, but when its features are obscured by a large caput succedaneum it also feels smooth and rounded. It is

recognised by feeling the mouth, with the tongue and alveolar ridges, and the supra-orbital ridges. A brow is recognised by feeling, on one side of the presenting part, the anterior fontanelle and the smooth frontal bone; and on the other, the supra-orbital ridges and the edges of the orbital cavity. A foot can be distinguished from a hand by feeling the heel; by noting that the line of the tops of the toes is straight, of the tops of the

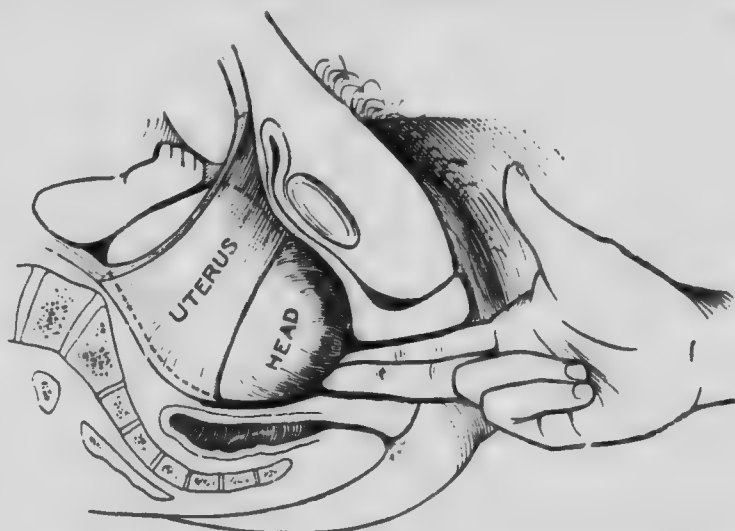


FIG 29.—The presenting vertex as felt by vaginal examination during the second stage.

fingers curved; and that the thumb can be apposed and opposed, while the great toe cannot. The knee can be distinguished from the elbow by its greater size; by feeling the patellar ligament and the patella, if the knee is not flexed; and especially by feeling the tuberosity of the tibia.

While examining the presenting part one can also determine whether any part of the ovum—as the cord or of the foetus—as a limb, has prolapsed into the vagina. In the former case, ascertain whether the cord

is pulsating or not ; in the latter case, ascertain whether the prolapsed limb is an arm or a leg, and the side to which it belongs.



FIG. 30.—Diagram showing the manner in which the head normally fills the lower uterine segment exactly.

If a uterine contraction comes on during the examination, we shall further be able to appreciate the rate of advance of the presenting part and the extent to which the membranes protrude into the vagina during a pain.

Normally, the protrusion of the membranes is slight

and in strict proportion to the size of the os ; in other cases, they project downwards into the vagina as a cone-shaped tumour, and may even reach the perinæum.

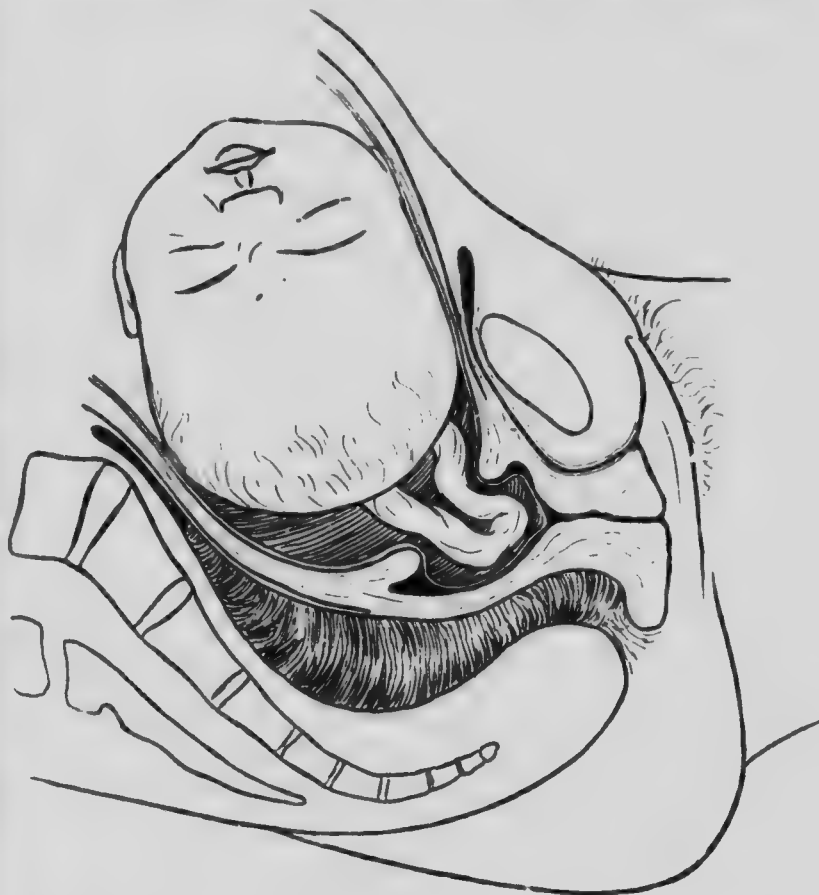
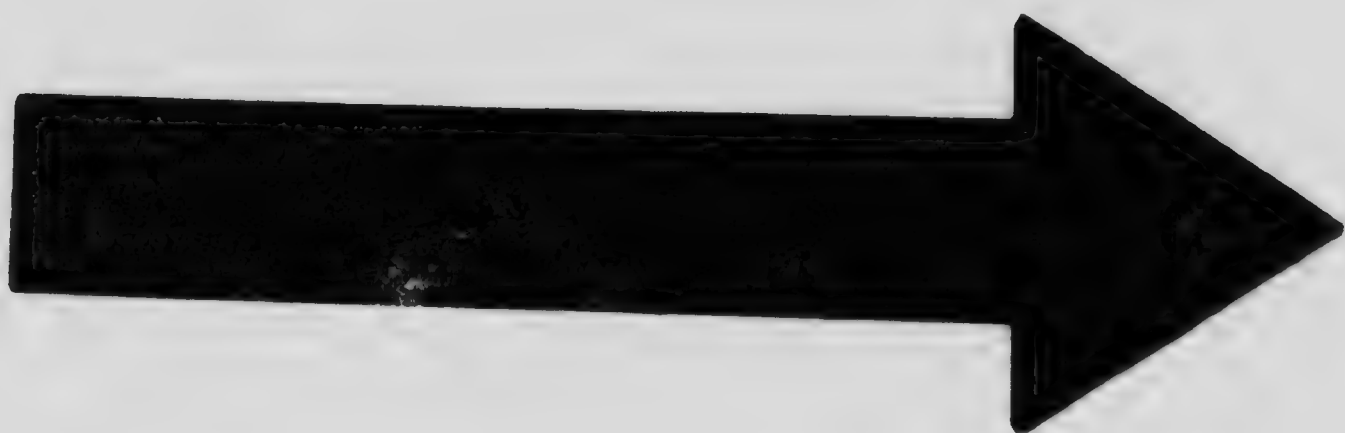


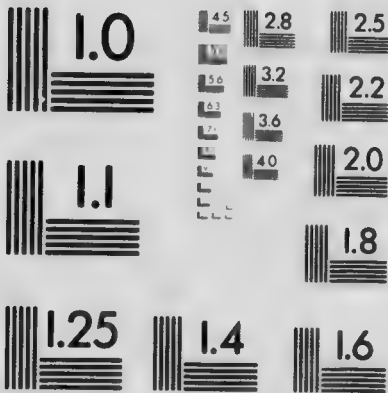
FIG. 31.—Diagram showing a head not filling the lower uterine segment exactly, thus permitting undue pressure on the membranes, and favouring their early rupture, and prolapse of the cord.

This undue protrusion of the membranes is never found in a normal case, but can always be noticed when the presenting part, or the shape of the pelvis, is abnormal. In a normal case, the presenting head fills the lower



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uterine segment completely ; consequently, before rupture of the membranes, the liquor amnii in front of the head is completely shut off from the liquor amnii round the body. When a contraction occurs, the head acts as a ball-valve, and prevents any more liquor amnii from being driven down in front of it (*v.* Fig. 30). Consequently, the tension on the membranes is increased only in proportion as the head advances, and their premature rupture is avoided. If, however, the presenting part does not fill the lower uterine segment exactly, owing to its irregular shape—as in face, breech, or transverse presentations, or if it is prevented from descending into the lower uterine segment—as in the case of contracted pelvis, then there is free communication between the water in front of the presenting part and the water behind it. The result of this is, that, when a contraction occurs, the liquor amnii round the body is driven downwards in front of the presenting part, and the pressure on the membranes is very greatly increased. This increased pressure causes, at first, undue bulging of the membranes downward, and, when the os has become partly dilated, their premature rupture (*v.* Fig. 31). When, therefore, this cone-shaped projection of the membranes is present, we immediately suspect that there is something abnormal, either in the pelvis, or in the presentation.

Lastly, sweep the fingers round the pelvic cavity and thus ascertain as far as possible the presence or absence of pelvic deformity or tumours, and the condition of the vaginal walls,—lax and moist, narrowed by cicatrices, or dry, as the case may be.

In some cases it may not be possible to obtain all the information we require, and to make a satisfactory diagnosis of the nature of the case by the mode of examination we have described. In such cases, one

should carry the examination further. The first step consists in placing the patient on her back in the cross-bed position, and then making an examination. In cases of pelvic deformity this is particularly necessary. If we still cannot decide on the nature of the case, the patient should be anæsthetised, and again examined, the whole hand if necessary being introduced into the vagina.

AUSCULTATION.

Auscultation of the foetal heart enables us to ascertain the vitality of the foetus; also to supplement abdominal palpation in diagnosing the presentation and position of the foetus, as the part of the abdomen over which the heart is heard with maximum intensity, depends upon the relationship of the foetus to the uterus. Let us imagine the abdomen divided into quarters by one line drawn vertically, and another drawn horizontally, through the umbilicus. Then, if the head is in the lower uterine segment, the heart will, as a rule, be heard best below the transverse line; and, if the head is at the fundus, it will be heard best above or on the same line. If the back, in a vertex or breech presentation, is to the left of the vertical line, the heart is as a rule heard best to the left of that line; if to the right of the line, the heart is heard to the right.

It is of great practical interest to recognise the relative merits of these three modes of examining a patient, as, while palpation and auscultation are free from danger so far as the patient is concerned, vaginal examination is not.

There are no difficulties in the way of making a vaginal examination; but, unfortunately, there is an ever-

present danger. Very many puerperal women die as a result of septic infection; and, if there were no vaginal examinations, there would be no cases of acute sepsis in previously healthy women. If, then, vaginal examination could be entirely abolished, or, at any rate, the number of vaginal examinations reduced to a minimum, very many lives would be saved. Let us see how far it can be replaced by abdominal palpation.

If we compare the information afforded by abdominal palpation and by vaginal examination respectively, we shall see that while many facts can be determined by abdominal palpation which cannot be determined by vaginal examination, there are very few facts which can be determined by vaginal examination alone. What are these facts? The most important is the diagnosis of prolapse or presentation of the cord. This certainly cannot be determined by palpation. It is a most important condition to recognise, and, therefore, one vaginal examination, at all events, must be made, except in those cases in which the presenting part was deeply engaged in the pelvis from the beginning of labour, as it is obvious that prolapse could not then occur.

Other points, that can be determined by vaginal examination alone, are the extent to which the cervix has been taken up and the uterine orifice dilated, the presence of intra-pelvic tumours, of contraction of the pelvic outlet, of fontanelle presentations, and of asynclitism (*v.* page 157) of the head. These points, however, can all be determined by a single vaginal examination.

The best time at which to make a vaginal examination is at the beginning of labour. If the head is then fixed, or fixes soon after, further vaginal examinations are unnecessary. If, however, the head is not fixed, another examination should be made as soon as the membranes rupture on account of the risk of prolapse

of the cord. All this points to the extreme importance of acquiring skill in practising abdominal palpation. If we possess it, the number of vaginal examinations can be very greatly restricted.

Examination by auscultation can only replace vaginal examination to a very limited extent. In conjunction with abdominal palpation, it affords a means of diagnosing the presentation and position of the fœtus. Its most important use is, however, to inform us of the condition of the fœtus—information which cannot be obtained by means of either of the other modes of examination.

PELVIMETRY.

Pelvimetry is the term applied to the measurement of the various diameters and distances of the pelvis. It is a method of diagnosis which is only required when the history of the patient, her appearance, or the information furnished by abdominal palpation or vaginal examination, lead us to suspect the existence of a contracted pelvis.

Pelvimetry may be external or internal. A little information can be obtained by means of the former—especially in the greater degrees of contracted pelvis, the most valuable information by means of the latter—in all cases. The principal external measurements of importance are as follows :—

- (1) The distance between the anterior superior spines of the ilium.
- (2) The distance between the most distant portions of the iliac crests.
- (3) The external conjugate, or Baudelocque's diameter—*i.e.*, the distance between the upper margin of the symphysis and the

depression under the spinous process of the last lumbar vertebra.

- (4) The distance between the posterior superior spines.
- (5) The transverse diameter of the outlet—*i. e.*, the distance between the tubera ischii.
- (6) The antero-posterior diameter of the outlet—

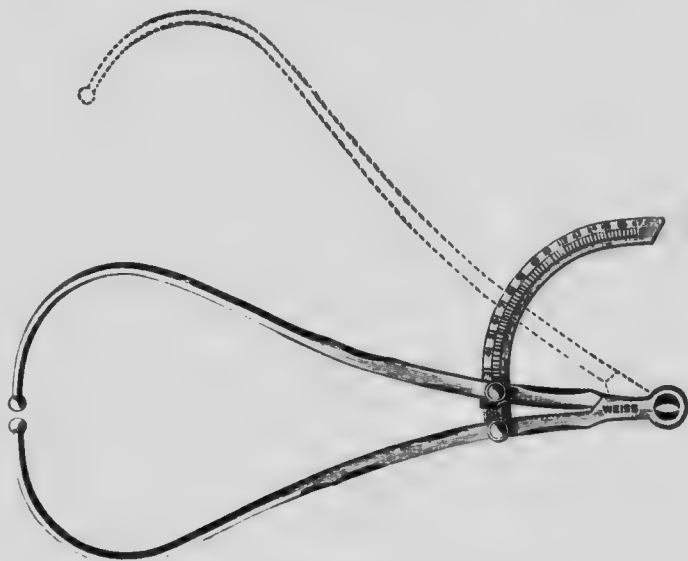


FIG. 32.—Martin's external pelvimeter.

i. e., the distance between the tip of the coccyx and the lower margin of the symphysis.

- (7) The distance between the trochanters.

These measurements can be obtained by means of an external pelvimeter such as Martin's. The method of using this instrument is simple and does not require much explanation. To measure the distances between the superior iliac spines, the iliac crests, or the trochanters, the patient lies on her back with her legs close together, while the examiner stands or sits below the

level of the hips, and facing her. He then takes the pelvimeter in both hands, holding the extremities of the limbs between his thumb and middle finger, and with the index fingers determines the exact positions of the points on which the instrument is to rest. The tips of the instrument are then placed on these points, and the distance between them read off on the scale. To measure the external conjugate the patient lies on her side with her back turned towards the operator. The instrument is held as before, and one limb is pressed firmly into the depression beneath the spine or the last lumbar vertebra, while the other is placed on the upper margin of the symphysis. To measure the distance between the posterior superior spines, the patient lies on her side or on her face, and the tips of the pelvimeter are applied to the depressions which mark the positions of the spines. To measure the distance between the tubera ischii, the patient must be placed in the lithotomy position. The inner margins of the tubera ischii are found, and the thumbs are so placed that the nails are directly over the points to be measured. An assistant then ascertains the distance between the nails with a pelvimeter with the blades crossed. To measure the antero-posterior diameter of the outlet, the patient is placed on her side with her back towards the operator. The position of the sacro-coccygeal joint is determined by passing the index finger into the vagina and palpating the tissue intervening between it and the thumb placed over the termination of the sacrum externally. One terminal of the pelvimeter is then placed on this joint, and the other on the sub-pubic ligament of the symphysis. From the measurement thus obtained, a deduction of one to one and a half centimetres (0.4 to 0.6 inch) must be made to compensate for the thickness of the sacro-coccygeal joint.

The principal internal measurements of importance are as follows :

- (1) The true conjugate—*i. e.* the distance between the promontory of the sacrum and the most prominent part of the back of the symphysis.
- (2) The oblique conjugate—*i. e.* the distance between the promontory of the sacrum and the lower margin of the symphysis.

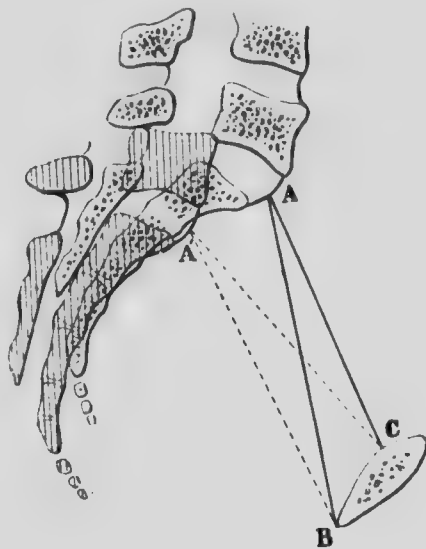


FIG. 33.—Diagram showing the manner in which the relationship between the true and the oblique conjugate is affected by the height of the promontory. A. Normal position of the promontory. A'. Unusually low promontory.

- (3) The transverse diameter—*i. e.* the greatest distance between the lateral margins of the brim.

These measurements can be ascertained as follows :
—With the fingers, we can measure the oblique conjugate, and from this we can then estimate the true conjugate. To measure the oblique conjugate, place

the patient in the cross-bed position, and under an anæsthetic if possible. Introduce the index and middle fingers into the vagina, and pass them upwards until the promontory of the sacrum is reached. While the fingers are in this position, mark, with the nail of the index finger of the other hand, the spot at which the sub-pubic ligament crosses the index finger of the

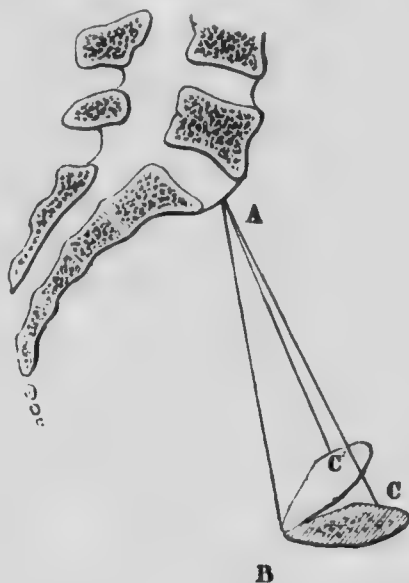


FIG. 34.—Diagram showing the manner in which the relationship of the true and the oblique conjugate is affected by the obliquity of the symphysis. B C'. Normal inclination of the symphysis. B C. A symphysis lying almost horizontally.

measuring hand. Then withdraw the fingers, and measure the distance between the tip of the middle finger and the mark on the index finger. This is the *oblique conjugate*. To obtain the true conjugate, on an average half an inch must be subtracted, but the exact amount differs in each case. If the symphysis lies more horizontally than normal, or is very thin and

very shallow, or if the promontory is lower than normal, half an inch will be too much to subtract. If the symphysis lies more vertically than normal, or is very thick or very deep, or if the promontory is higher than normal, half an inch will be too little (*v.* Figs. 33 and 34). Therefore, in order to ascertain the exact amount that it is necessary to subtract we must allow for :—

- (1) The obliquity, the thickness, and the depth of the symphysis.
- (2) The height of the promontory.



FIG. 35.—Skutsch's pelvimeter.

The ability to determine the proper correction can only be obtained by constant practice. This is the great drawback to internal measurements taken with the fingers, to overcome which various forms of internal pelvimeters have been devised. Of these, much the best is that bearing the name of Skutsch.

Skutsch's pelvimeter, if carefully worked, gives far more reliable information than the fingers (*v.* Figs. 35 and 36). It consists of three parts—a rigid limb with a slight curve upon it, a flexible limb, and a circular movable bar which connects the two. The rigid and

the flexible limbs lock into one another, in such a manner that either the concave or the convex aspect of the rigid bar can be turned towards the flexible bar. The movable connecting bar is so adjusted that the limbs can be separated from one another, and then returned to exactly the same position. This is necessary in order to facilitate the withdrawal of the limb in the vagina.

In order to use the pelvimeter, the patient must as a rule be anaesthetised. To measure the true conjugate

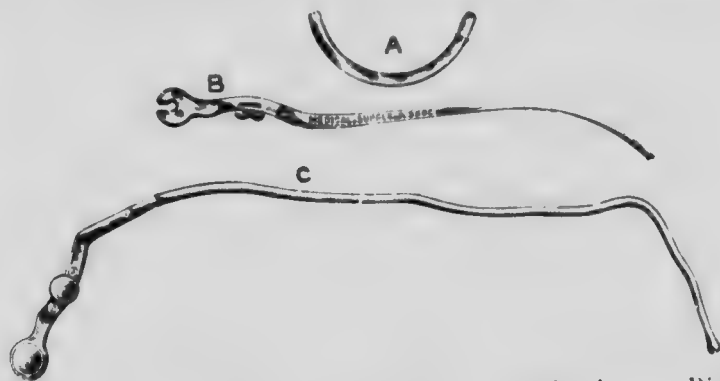


FIG. 36.—Skutsch's pelvimeter. A. Movable connecting bar. B. Rigid limb. C. Flexible limb.

a mark is made with an aniline pencil on the skin over the centre of the symphysis (v. Fig. 37). The instrument is then so adjusted that the rigid limb curves away from the flexible limb. Pass two fingers of the right hand into the vagina, and upwards until they lie against the promontory of the sacrum. Then slip the rigid limb of the instrument upwards, along the fingers, until it rests on the most prominent point of the promontory. Hold it exactly in this position, while an assistant bends the flexible limb until it just touches the blue mark over the symphysis (A B, Fig. 37). The instrument is then carefully withdrawn, and the distance

between the extremities of the limbs measured. Next, reverse the rigid limb, so that it curves towards the flexible one. Introduce the fingers again into the vagina and feel for the most prominent point on the back of the symphysis. Guide the rigid limb up until it rests on this point, and hold it there, while the



FIG. 37.—Diagram representing the distances measured, when ascertaining the length of the true conjugate.

assistant bends the flexible limb until it presses against the blue mark with the same degree of force that it did when taking the first measurement (A C, Fig. 37). Separate the limbs before removing the instrument, as otherwise they may be forced apart. Then remove it, and adjust the limbs to their original position. Subtract the distance between them, *i. e.* the thickness of

the symphysis and the overlying skin, from the former measurement, and the result is the length of the true conjugate.

In order to measure the transverse diameter, make a mark over the great trochanter of the femur at one side (A, A, Fig. 38). With the rigid limb in the vagina, under the guidance of the right hand, measure the distance from this mark to the most distant point of the pelvic brim (A B, Fig. 38). Then in a similar manner, but with the left hand in the vagina, measure

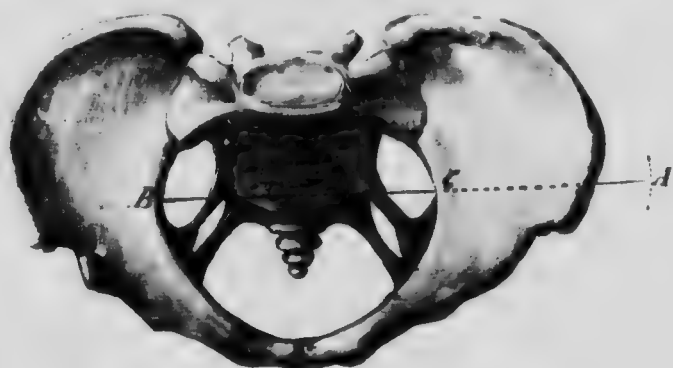


Fig. 38.—Diagram representing the distances measured, when ascertaining the length of the transverse diameter.

the distance from the blue mark to the nearest point of the pelvic brim (A C, Fig. 38). Subtract the measurement thus obtained from the first measurement, and the result is the transverse diameter. From these measurements, and from the palpation of the pelvic brim, we can in most cases deduce the nature and the degree of the contraction.

CHAPTER V.

PREGNANCY AND ITS PHENOMENA.

Definition—Duration—Phenomena of: Changes in the Uterus: Changes in remainder of Genital Tract, Vagina, Tubes, Ovaries, Ligaments: Changes in Pelvic Joints: Breast Changes: Mechanical Effect of Growing Uterus: Remote Effects of Pregnancy, Circulation, Respiration, Urinary System, Digestive System, Nervous System, Pigmentation.

Definition.—Pregnancy is the term applied to the condition of a woman when she contains within her the product of conception. It begins with the fertilisation of the ovum, and ends with the expulsion of the latter.

Duration.—The duration of pregnancy is usually considered to be ten lunar months, or nine calendar months and seven days, or 280 days, such period being counted from the first day of the last menstruation. In a large number of cases in which pregnancy resulted from a single coitus, the average duration was found to be from 272·2 to 273·5 days (Loewendhardt, Hasler, Hecker). It is usually considered that impregnation is most likely to occur a few days before, or a few days after, a menstrual period. Ahlfeld's statistics—obtained from cases in which pregnancy followed a single coitus—do not, however, bear out the view that just before a menstrual period is a likely time. According to these statistics, in 37 per cent. of cases, the coitus had

occurred in the first week after menstruation ; in 35 per cent., in the second week ; in 15 per cent., in the third week ; in 9·7 per cent., in the fourth week ; in 2·7 per cent., on the 29th to 31st days.

THE PHENOMENA OF PREGNANCY.

Changes in the Uterus.—The uterus in its fully developed virginal condition is a pear-shaped organ, somewhat flattened from before backward. Its average dimensions, as given by Waldeyer, are as follows :—

| | Nulliparæ. | | Multiparæ. | |
|-------------------------|-----------------|--------------|-----------------|----------------|
| Length of entire uterus | 2 $\frac{3}{4}$ | in. 6·5 cm.) | 3 | in. (7·5 cm.). |
| " corpus uteri . | 1 $\frac{3}{4}$ | " (4 ") | 1 $\frac{1}{2}$ | " (4·5 "). |
| " cervix uteri . | 1 | " (2·5 ") | 1 $\frac{1}{2}$ | " (3 "). |
| " entire cavity | 2 $\frac{1}{2}$ | " (5·5 ") | 2 $\frac{3}{4}$ | " (6·5 "). |
| " cavity of body | 1 $\frac{1}{2}$ | " (3 ") | 1 $\frac{1}{2}$ | " (4 "). |
| " " cervix | 1 | " (2·5 ") | 1 | " (2·5 "). |
| Greatest width of body | 1 $\frac{3}{4}$ | " (4 ") | 1 $\frac{1}{2}$ | " (4·5 "). |
| " thickness | 1 | " (2·5 ") | 1 $\frac{1}{2}$ | " (3 "). |

It weighs from seven to twelve drachms (33 to 41 grms.), and its cavity has sufficient capacity to hold one or two drops of fluid.

At full term its condition is very much altered. It is then from twelve to fourteen inches (31—36 cm.) in length, nine and a half inches (24 cm.) in width, and from eight to nine inches (21—23 cm.) in depth. Its weight has increased to something between a pound and a half and three pounds (681—1362 grms.), and its cavity has a capacity of about two hundred and fifty to three hundred cubic inches (4000—5000 c.cm.). The gradual manner in which this increase in size takes place is shown by the following table. It must be noted that in the table pregnancy is divided into nine calendar months instead of, as is done elsewhere through this book, into ten lunar months.

| | Length. | | Width. | | Depth. | |
|------------------|---------|---------------|--------|--------|--------|--------|
| | In. | Cm. | In. | Cm. | In. | Cm. |
| End of 3rd month | 4.5 | 5 (11 - 12.5) | 4 | (10) | 3 | (7.5) |
| " 4th " | 5.5 | 6 (13.5 - 15) | 5 | (12.5) | 4 | (10) |
| " 5th " | 6 | 7 (15 - 18) | 5.5 | (13.5) | 5 | (12.5) |

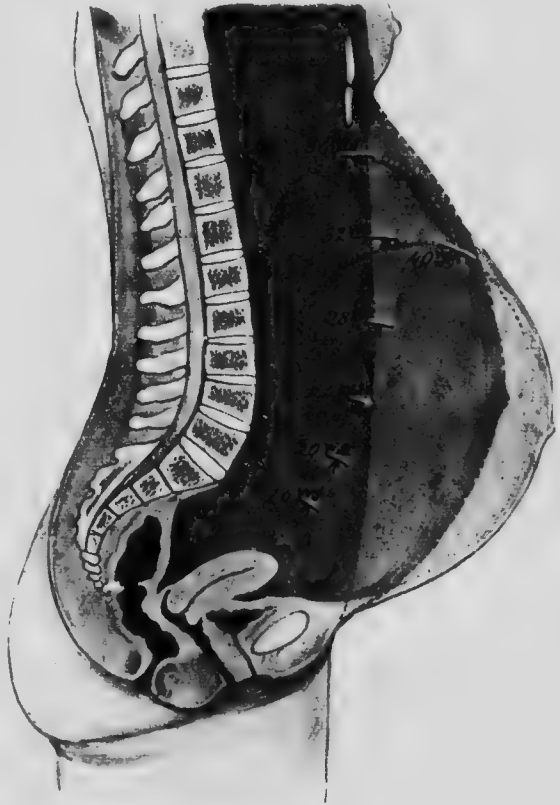


FIG. 39.—Diagram showing the height of the uterus at the different weeks of pregnancy.

| | | | | | |
|------------------|----|--------------------|------------|-----|---------|
| End of 6th month | 8 | - 9 (20 - 22) | 6.5 (16.5) | 6 | (15) |
| " 7th " | 10 | - 11 (25.5 - 28) | 7.5 (19) | 6.5 | (16.5) |
| " 8th " | 11 | - 12 (28 - 30.5) | 8 (20) | 7 | (18) |
| " 9th " | 12 | - 14 (30.5 - 35.5) | 9.5 (24) | 8-9 | (20-22) |

(Farre and Tanner.)

According as the uterus gradually increases in size, the fundus rises gradually higher in the abdomen. In the non-pregnant state, the uterus lies with its anterior surface in approximation with the bladder, and with the tip of the cervix on a level with the line joining the ischiatic spines. At full term, the fundus of the uterus is found midway between the umbilicus and the ensiform cartilage. Its size and position in the intermediate months are shown by the following table (7. Fig. 39).

At the end of 2nd month the uterus is the size of a large orange.

| | | | | | |
|---|------|---|---|---|---|
| " | 3rd | " | " | " | foetal head at term. |
| " | 4th | " | " | " | the fundus is half way between the symphysis and the umbilicus. |
| " | 5th | " | " | " | two fingers' breadth below the umbilicus. |
| " | 6th | " | " | " | at umbilicus. |
| " | 7th | " | " | " | three fingers' breadth above umbilicus. |
| " | 8th | " | " | " | midway between umbilicus and ensiform cartilage. |
| " | 9th | " | " | " | up to ensiform cartilage. |
| " | 10th | " | " | " | same as at eighth month. |

In the early months of pregnancy, the increase in the size of the uterus is due to eccentric hypertrophy of its walls. In the middle and later months, on the other hand, increase is due to the mechanical distension caused by the growing ovum, without any accompanying increase in thickness in the muscle wall. As a result, there is an actual thinning of the walls, a thinning which is more or less marked in different cases.

In addition to the alterations which occur in the size and position of the uterus, important changes take place also in the muscular coat, mucous membrane, ligaments, and vessels. "The colour of the uterus

becomes darker, its tissue less dense, and its muscular bundles more evident. A very great increase takes place in the muscular tissue, this increase being mainly the result of the enlargement of the already existing elements; the cells become enlarged to the extent of from seven to eleven times in length, and from two to five times in breadth (Köl liker). A formation of new cells is also said to occur, mainly in the innermost layers (but whether by proliferation of pre-existing cells, or otherwise, is not stated), and to continue until the sixth month of pregnancy, when it ceases. The round ligaments become enlarged, and their muscular structure more marked; the broad ligaments are encroached upon by the intrusion of the growing uterus between their layers. The mucous membrane and the glands of the uterus at first undergo an enlargement very similar to that which precedes menstruation. Subsequently they become the seat of peculiar changes, whilst the membrane of the cervix loses its columns and rugæ. The blood-vessels and lymphatics are greatly enlarged, and it is observed that the arteries become exceedingly tortuous as they ramify upon the organ. The nerves also undergo considerable increase in size." (Symington.)

In addition to the alteration in its lining membrane, the cervix as a whole undergoes two changes. The first of these is a gradual softening of its tissue, a softening which begins at the tip and gradually extends upwards until the whole cervical tissue is affected. This is due to a vascular engorgement and serous infiltration of the cervical tissue. The second change is known as the "apparent shortening" of the cervix. This condition is also a progressive change, and is due to three factors:—

- (1) The progressive softening of the cervical tissue

makes it difficult to feel the softened tissue with the examining finger.

(2) The softening and relaxation of the cervico-vaginal attachments, allow the drawing upwards of the entire cervix as a result of the progressive increase in size of the uterus. This drawing upwards may cause an actual shortening of the vaginal portion of the cervix, although the length of the cervical canal remains unchanged; and, consequently, the shortening will be apparent not only on digital examination, but also if the cervix is examined through a speculum.

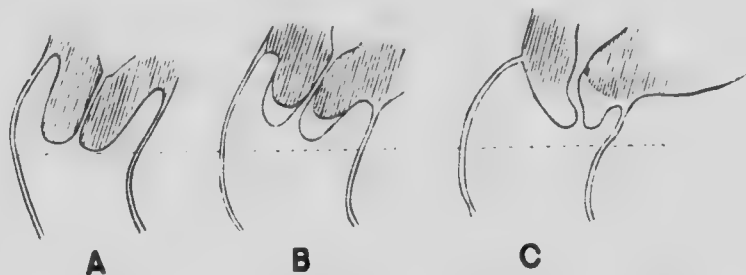


FIG. 40. —Diagram to show the changes in the position and consistency of the vaginal portion of the cervix during pregnancy. A. Cervix at beginning of pregnancy. B and C. The unshaded portion shows the progressive softening of the cervix. The latter is also drawn up and tilted forwards against the anterior vaginal wall.

3) At the beginning of pregnancy, the axis of the cervix more or less corresponds with the axis of the pelvic brim. As pregnancy continues, and as the uterus increases in size, the junction of the cervix and uterus is pushed backwards, and the anterior fornix becomes partially effaced. The result is that the os externum approaches the anterior vaginal wall, and consequently the cervix does not protrude so much into the vagina. Accordingly the cervix seems to be shortened, although in reality the change probably results in a certain degree of lengthening (*v.* Fig. 40).

Another effect of pregnancy on the cervix is that the cervical canal becomes occluded owing to the presence of a firm plug of mucus, the result of the increased activity of the cervical glands. This plug, which has been already mentioned, is known as the *operculum*.

The changes, which take place in the mucous membrane of the uterus, lead to the formation of the decidua in the manner that has been already described (*v.* page 15).

Changes in the Remainder of the Genital Tract.—

The vagina.—The mucous membrane and the muscular wall of the vagina become hypertrophied and turgid, and, as a result of vascular engorgement, the mucous membrane becomes of a more or less deep violet colour. During the third and fourth month, the elevation of the uterus draws up the anterior vaginal wall, and so stretches the mucous membrane; but, subsequently, as a result of hypertrophy, the latter comes to hang in transverse folds, which may appear at the vulva. The follicles of the vulva secrete more actively, and varicosities of the veins often appear in the same region.

The Fallopian Tubes.—The Fallopian tubes also hypertrophy, and lengthen as the uterus rises. As the fimbriated extremity remains in the neighbourhood of the ovary, the tubes, towards the end of pregnancy, are almost perpendicular to the plane of the brim of the pelvis. Further, in consequence of the growth of the fundus, the tubes at the end of pregnancy enter the uterus at the junction of its upper and middle thirds, instead of at its highest part, as in the non-pregnant state.

The Ovaries.—Ovulation, *i.e.* the discharge of a ripe ovum from a Graafian follicle, probably occurs at about the time of a menstrual period. If the ovum is fertilised and pregnancy results ovulation probably ceases, to recur at some date during or just after the puer-

perium. The remains of a Graafian follicle, left after the discharge of an ovum, undergo an important and interesting series of changes which result in the formation of the corpus luteum. After rupture, the walls of the follicle contract and come into contact with one another. The inner or vascular layer of the basement membrane is less contractile than the outer and so is thrown into folds, which, as they increase in extent, encroach on the cavity of the empty follicle, until this has become entirely filled. The cells of the membrana granulosa, *i.e.* the lining of the Graafian follicle, are

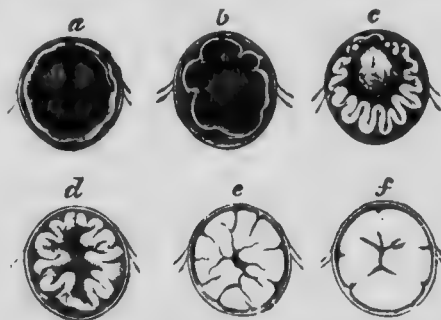


FIG. 41—Diagram of the formation of the corpus luteum. *a*. The cavity of the follicle filled with blood. *b, c*. The clot diminishing in size, while the epithelial lining becomes thickened and convoluted, and the clot decolorised. *d, e, f*. Completion of this process. In *f* the convolutions have coalesced, remaining only as a central stellate cicatrix. (Galabin)

thrown off and disappear, and are replaced by numerous polygonal cells derived from the vascular layer of the capsule of the follicle. These cells are epithelial in appearance, they proliferate actively, and they secrete a yellow pigment. They are usually known as "lutein cells," and the pigment is known as "lutein." They gradually fill the lumen of the follicle, and small tufts of blood-vessels grow into them from the ovarian stroma. Growth continues for about three weeks, and then ceases. The cells lose their outlines and break

down into detritus. The fibrous tissue encroaches more and more on the cellular part, and the sharp differentiation, which at first existed between the corpus luteum and the surrounding ovarian tissue, gradually lessens. After a time, the two merge, and in this way the corpus luteum disappears. The central cavity of the follicle is at first occupied by a blood-clot. As the cells hypertrophy, they gradually press more and more upon this clot, and it in turn shrinks, becomes decolorised and absorbed, and finally is represented by a stellate-shaped cicatrix lying in the centre of the convoluted and hypertrophied follicle walls. When pregnancy does not occur, nothing is left of the corpus luteum but a fibrous scar to which the term "corpus albicans" is applied.

If the discharged ovum is impregnated, the corpus luteum continues to grow until the third or fourth month and is larger, its walls are thicker, and its colour a much brighter yellow. This change is probably due to the fact that the secretion of the lutein cells is required to discharge some particular function, and in some way to control the course of pregnancy.

During pregnancy the ovaries are drawn slightly above the pelvic brim, and are brought close to the sides of the uterus as the result of the growth of the latter outwards into the layers of the broad ligament, and also of the upward stretching of the broad ligament itself.

The ligaments.—The round ligaments, the muscle-fibres and blood-vessels of the broad ligaments, and the pelvic cellular tissue share in the general hypertrophy and vascular engorgement. The left round ligament as a rule can be felt through the abdominal wall in patients who are not very stout, owing to its increase in size and to the fact that the uterus is dextro-rotated.

Changes in the Pelvic Joints. As pregnancy advances, the cartilages of the sacro-iliac and the sacro-



FIG. 42.—Breast at the seventh month of pregnancy. A. Nipple. B. Primary areola. C. Montgomery's follicle. D. Mottling of secondary areola. E. Striae. F. Enlarged veins. (*Montgomery.*)

occygeal joints become softened, and their synovial cavities enlarged. As a result, the power of walking is

somewhat interfered with, and in some patients may be almost lost. We shall refer later to the effects, during parturition, of this temporary relaxation of the joints (*v.* page 130).

Changes in the Breast —The first change noticed in the breasts comes on about the second month, and consists in an enlargement of the superficial veins and of the breast itself. At the same time the nipple and primary areola have a puffy appearance, and glandular follicles develop upon the latter (Montgomery's follicles). During the next couple of months, the colour of the primary areola deepens in proportion to the complexion of the patient, and its diameter is increased. During the fifth month, the secondary areola becomes noticeable round the primary areola—"numerous round spots or mottled patches of a whitish colour scattered over the outer part of the areola, and for about an inch or more all round, presenting an appearance as if the colour had been discharged by a shower of drops falling upon the parts" (Montgomery). From the sixth month on, shining red lines radiating from the primary areola appear, due to rapid over-distension, and akin to the *striae gravidarum* of the abdomen (*v.* Fig. 42). On palpation, from the second month onward, the breasts are found to be firmer and more knotty than in non-pregnant women. If they are squeezed, colostrum may exude from the nipple.

Mechanical Effects of the Growing Uterus. As the uterus grows, it produces definite and well marked effects of pressure and distension upon the adjacent organs. The increased weight of the uterus causes increased pressure upon the bladder in the early months, and consequent irritability of the bladder with frequent micturition. As the uterus rises out of the pelvis, this trouble disappears to a great extent or altogether, but

often returns in the later months as the result of the pressure of the fetal head. Constipation frequently occurs as the result of interference with the peristaltic action of the intestines, which, as the uterus grows, are pushed upwards, backwards, and to the sides. Pressure upon the intra-pelvic veins gives rise in many cases to the formation of varicosities of the veins of the legs, and may sometimes even cause œdema. Varicosities of the vulvar and anal veins may also occur from the same cause. The distension of the abdominal walls results in two very constant occurrences—the formation of *lineæ* or *striæ gravidarum*, and the obliteration of the umbilical depression. *Striæ gravidarum* are reddish or bluish lines radiating upwards from the mons Veneris, and due to a loss of elasticity in, and to tearing of, the cutis vera and the rete Malpighii, consequent on the stretching caused by the enlarging uterus. They occur during the last three months of pregnancy, and subsequent to delivery they become white. Occasionally they may become the seat of a serous or lymphatic infiltration. They may also occur on the skin covering the buttocks, the thighs, and the breasts. The umbilical depression disappears during the seventh or eighth month, and during the last month its place is taken by a small knob-like elevation. Separation of the recti muscles may also occur, especially in cases of excessive enlargement of the uterus, and in pluriparous women.

During the early part of the tenth month the pressure of the uterus interferes with the movements of the diaphragm and so causes dyspnœa. Disturbance of digestion from pressure upon the stomach may also occur. Both these symptoms subside somewhat during the last fortnight, in consequence of the sinking of the uterus.

Remoter Effects of Pregnancy.—*Circulation.*—In

order to allow for the increased uterine circulation the total quantity of blood in the body is increased, but the increase occurs more in the watery than in the solid constituents. There is an increase in the proportion of fibrin-forming substances, and in the number of white blood-corpuscles, and a diminution in the proportion of red blood-corpuscles to the blood-corpuscles, and in the proportion of albumin. The heart becomes somewhat dilated, with a rather more than compensatory hypertrophy, a condition which is probably due to the extra amount of work thrown upon it and to the increased blood-pressure. Another consequence of this increase in pressure is seen in the enlargement which takes place in the thyroid gland and the spleen.

Respiration.—An increased discharge of carbonic acid through the lungs takes place, and has been estimated to be as much as twenty-five per cent. The transverse diameter of the chest increases and the vertical diameter diminishes, their united effect being to leave the capacity of the chest practically unaltered. Respiration becomes more thoracic in character.

Urinary system.—The kidneys are as a rule increased in size and somewhat congested. The quantity of urine is increased, a change due to the increase in the water. There is also an increase in the total amount of solids excreted. The presence in the urine of a copper-reducing substance, which has been found to be lactose, and which gives rise to the so-called physiological glycosuria, can frequently be detected in the later months of pregnancy. It is probably connected with the absorption of milk.

Digestive system.—Slight disturbances in the digestive system occur in a large proportion of pregnant women. They manifest themselves by the occurrence of nausea, vomiting, salivation, pyrosis, and constipation. Usually

the appetite is increased, but sometimes it is diminished. The general nutrition of the body is if anything improved, as is evidenced by the increase in weight of the patient during the last three months—an increase which is more than can be accounted for by the growth of the ovum. The average increase is said to be 5 lb. 4 oz. (2400 grms.) during the eighth month, 3 lb. 11 oz. (1690 grms.) during the ninth month, and 3 lb. 6 oz. (1540 grms.) during the tenth month (Hecker and Gassner).

Nervous system.—Disturbances of the nervous system are, to a varying degree, the rule during pregnancy. They are due to the exalted and hyper-irritable condition of the nerve centres. They evidence themselves by the occurrence of neuralgias, disturbance of digestion, hysterical attacks, unnatural wishes or cravings—the so-called *pica* or “longings” of pregnancy,—faintings, cutaneous eruptions, and alterations in the temperament.

Pigmentation.—A deposit of dark pigment usually occurs in the following regions:—the areolæ of the breast, the lower part of the abdomen and the groins, the axillæ, along a line running from the pubes to the umbilicus or even as far as the ensiform cartilage, and beneath the eyes and about the temples (*chloasma uterina*).

CHAPTER VI.

THE DIAGNOSIS AND MANAGEMENT OF PREGNANCY.

The Diagnosis of Pregnancy—Subjective Symptoms—Objective Symptoms—The Doubtful, Probable, and Certain Signs of Pregnancy—Estimation of the Date of Pregnancy—Is the Fœtus Alive or Dead?—Management of Pregnancy.

THE DIAGNOSIS OF PREGNANCY.

ONE of the most important questions that comes before the medical practitioner, is the task of diagnosing the existence or non-existence of pregnancy. The diagnosis may be all-important, and the result of a mistake disastrous. The practitioner who undertakes the consideration of the question should always remember, that though the evidence may be tolerably certain so far as he is concerned, still the expression of his diagnosis must be guarded unless absolute certainty dictates it.

The diagnosis is based on certain subjective and objective symptoms.

The most important subjective symptoms of pregnancy are :—

The Cessation of the Menses.—This, in all probability is an invariable accompaniment of pregnancy. Cases have been recorded of supposed menstruation during the first three months, but such cases are

perhaps more correctly considered to be hæmorrhages of pregnancy. At all events, it is obvious that menstruation cannot occur after the decidua vera has coalesced with the decidua capsularis, *i. e.* after the third month. In estimating the value of amenorrhœa as a diagnostic sign, it must however be remembered that amenorrhœa due to disease is not an uncommon condition, particularly in chlorotic or anæmic girls, and also that slight irregular hæmorrhages—which the patient may term menstruation—occasionally occur in the early months of pregnancy.

2) **Morning Sickness.**—Nausea, slight retching, or actual vomiting when the patient wakes in the morning is a very common accompaniment of pregnancy. It usually begins early in the second month, and may persist until the end of the fourth month (Chap. XV).

3) **Quickening.**—This is the term applied to the sensation experienced by the mother when she first feels the foetal movements. It usually occurs about the eighteenth week, but its exact date is variable. In a multipara it is a sign of importance, as she is usually able to recognise its occurrence, but even in her case it is not infrequently simulated by, or mistaken for intestinal movements.

(4) **Salivation, etc.**—Salivation, pyrosis, and various nervous disorders are also included under this heading, as they are matters regarding which the patient informs the physician, in contra-distinction to the facts of which he informs himself by examination. Their diagnostic value is small.

The foregoing subjective symptoms are of slight importance when taken by themselves, as the patient may wilfully deceive us, or be herself deceived. But when we consider them in conjunction with the objective

symptoms, and when we find that the one confirms the other, they then become of value.

And now to consider the objective symptoms. We shall assume that there is no difficulty in the way of a full examination of the patient. This being so, it is best to examine her in the routine manner adopted in disease.

The Face.—In some cases there is excessive pigmentation occurring at the sides of the nose, under the eyelids, and about the upper lip.

The Breasts.—The various changes which occur in the breasts have already been noted (*v.* page 90). The most important of them from a diagnostic point of view are :—

- (1) The enlargement of the superficial veins and of the breast itself.
- (2) The appearance of Montgomery's follicles (*v.* Fig. 42).
- (3) The deepening of the colour of the primary areola.
- (4) The formation of the secondary areola.
- (5) The increased firmness of the breast.
- (6) The presence of colostrum.

Some of these changes have also been noticed in cases of myomata of the uterus and ovarian tumours.

The Abdomen.—*Inspection.*—During the first two months of pregnancy there is a slight sinking in of the abdominal wall between the umbilicus and the symphysis, a condition due to the sinking of the uterus into the pelvis, owing to its increased weight. From the end of the second month onwards, the abdomen enlarges in correspondence with the period of pregnancy. During the last three months, striæ or lineæ gravidarum appear as a result of the stretching of the abdominal walls. The abdomen may also be more or less pig-

mented, especially in the middle line and about the groin.

Percussion.—By this means, we can map out the size of the abdominal tumour, and determine whether it is dull or resonant. In this manner, flatulence and phantom tumours may be excluded.

Palpation.—From the third month onwards a tumour can be felt in the abdomen, and one can determine its size, its consistency, the regularity of its surface, and the irregularity of its contents. In pregnancy, the enlarged uterus feels smooth and ovoid, and irregularities in its contents, viz. the fœtal parts, can be felt, if pregnancy is sufficiently far advanced. The fœtus can be also moved about between the two hands—that is, external ballottement (*ballotter*, to toss) can be obtained. As we examine, we notice that the uterus becomes hard from time to time, *i. e.* it contracts. There is no pain accompanying these contractions.

Auscultation.—Several different sounds can be heard over the abdomen of a pregnant woman:—

1) *The fœtal heart.* This is heard from the sixteenth to the eighteenth week onward; it beats at the rate of 120 to 160 per minute, and sounds like the ticking of a watch. Its rate is diminished during uterine contractions and when the funis is compressed during delivery. It is increased owing to feverish conditions of the mother, and after very active fœtal movements. The heart is heard best over whatever part of the fœtal trunk is most closely in contact with the anterior uterine wall.

2) *The uterine souffle.* This is a blowing sound produced in the ascending branches of the uterine arteries; it is heard more plainly over some parts of the uterus than others, and, of course, is synchronous with the mother's pulse. It has been attributed to the

flowing of blood through large tortuous arteries, and also to the altered quality of the blood in pregnancy, the latter circumstance determining the souffle as in the venous murmur of anæmia. The uterine souffle is first heard towards the end of the fourth month, *i.e.* a little earlier than the foetal heart. It may also be heard in cases of uterine tumours—as myomata.

(3) *The funic or umbilical souffle.* This souffle is produced in the vessels of the cord, probably in the umbilical vein. It is synchronous with the foetal heart, and generally is caused by the cord being twisted round the child, or by its being compressed beneath the stethoscope. Its presence is said to be of unfavourable import for the child.

(4) *The maternal heart-sounds.* If these are rapid they may be mistaken for the heart-sounds of the child. To avoid this mistake the finger should always be placed on the mother's pulse whilst auscultating the foetal heart.

(5) *Respiratory murmur of the mother.*

(6) *Movements of the child.*

(7) *Friction between uterus and abdominal wall.*

(8) *Crepitating noises.* These are due to air in uterus or abdominal walls.

(9) *The muscular susurrus.* This is the term applied to the note given out by contracting muscle-fibre.

(10) *Intestinal sounds—borborygmi.*

The Vulva and Vagina.—*Inspection.*—The vulvar and vaginal mucous membrane becomes of a bluish-purple colour, due to venous stasis, which in turn is the result partly of the pressure of the enlarging uterus and partly of the increased supply of blood to the pelvis generally. This is Jacquemin's and Spiegelberg's sign of pregnancy. It is also sometimes noticed in cases of uterine myomata and ovarian tumours when they

attain any considerable size, but, in the case of pregnancy, it occurs with a smaller uterine enlargement than in the case of myomata.

Vaginal examination.—A vaginal examination is next made with the patient if possible in the dorsal gynæcological position, and it is upon the information it gives, supplemented by the patient's history, that we chiefly rely for the diagnosis of pregnancy in the early months. First, note the consistency of the cervix. It begins to soften from the beginning of pregnancy, and this softening starting below extends upwards as pregnancy advances, until at term it is so marked that the cervix can hardly be felt. It is more marked in multiparæ than primiparæ.

The next point to note is the size, shape, and consistence of the body of the uterus. Its size is increased in proportion to the duration of pregnancy (*v.* page 81); its shape has become more globular on account of the increase in its antero-posterior diameters; and its consistence is softer and more elastic.

Next try to obtain internal ballottement. It can be got by passing the fingers into the anterior fornix and pressing suddenly upwards against the uterus. Keep the fingers in the same position, and, if the case is suitable, the displaced fœtus will be felt to fall back upon them, causing a slight sensation of shock (*choc en retour*). The occurrence of this phenomenon depends on two factors:—First, that the fœtus is large enough to be felt; secondly, that it is sufficiently movable in the liquor amnii to be displaced easily. Both these factors are present during the fourth and fifth months. This sensation of ballottement can be simulated by other conditions:—a pedunculated myoma or malignant masses floating in ascitic fluid, and a large calculus lying in a distended bladder. The *choc en retour* is also

very closely imitated by a pulsation of the uterine artery, under certain conditions. If, when pressing the fingers upwards, we compress the uterine artery, its pulsations cease. Then, as the pressure of the fingers is involuntarily lessened, the artery beats again, conveying an impression to the finger similar to that of



FIG. 43.—Hegar's sign of pregnancy.

ballottement. This mistake is of course easily avoided by keeping the fingers in the same position for a little longer, when the subsequent pulsations of the vessel will be felt.

Now attempt to get Hegar's sign of pregnancy,—the marked softening of the lower uterine segment. It is best obtained by passing the thumb into the vagina

and one finger into the rectum, and then pressing the fundus downwards with the other hand on the abdominal wall, so that the lower uterine segment can be grasped between the finger and thumb (*v.* Fig. 43). If pregnancy is present, the whole lower uterine segment is so softened that there seems to be no connection between the fundus and the cervix. At the same time the fundus seems globular. This is a tolerably reliable sign. It is found from the second month onwards, but may possibly be obtained in a non-pregnant uterus, especially after complete or incomplete abortion.

Lastly, palpate the ureters, as they hypertrophy during pregnancy. To find them, palpate the back of the symphysis with the finger in the vagina, and then, starting above at one side of the joint, draw the finger downwards and slightly outwards along the back of the pubes. The ureter, which here lies between the anterior vaginal and the posterior bladder wall, is displaced forwards against the pubes, and is felt to slip from under the finger. It will require some practice to be able to tell if it is enlarged or not. If it is felt at all by the student it is probably hypertrophied, as it is difficult to feel a non-hypertrophied ureter. While we are palpating the ureter, the increased pulsation in the lateral fornices will also be noticed.

Now, let us consider the value of these different signs. They can be divided into doubtful, probable, and certain signs, and can be classified accordingly.

| Doubtful. | Probable. | Certain. |
|------------------|----------------------------|---------------------|
| Nausea. | Breast changes. | The foetal parts. |
| Salivation. | Internal ballotement. | The foetal heart. |
| Pigmentation. | Blue colour of vagina. | Movements of foetus |
| Longings. | Increased pulsation in | when felt or heard |
| Cessation of the | lateral fornix. | by doctor. |
| menses. | Softening of lower uterine | Funic souffle. |
| | segment. | |

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| Doubtful. | Probable. | Certain. |
|-------------------------|---|----------|
| Enlargement of abdomen. | Enlargement of the uterus. The occurrence of intermittent contractions. Uterine souffle. Hypertrophy of the ureters. | |

In default of certain signs, a probable diagnosis can be made by noting a correspondence between the subjective and objective symptoms. For instance, if the duration of amenorrhœa corresponds to the size of the uterus, or if the date of quickening corresponds to either of them, then we have a very reliable clue to the condition. The diagnosis has to be made in the early months from any condition which may give rise to enlargement of the uterus, as subinvolution, metritis, or small myomata—the menstrual history will then usually suffice for a provisional diagnosis, also from acquired amenorrhœa, due to anæmia, phthisis, change of conditions of life, etc. The latter class of cases is much more difficult to diagnose, and a certain diagnosis can only be arrived at in course of time. In the later months a diagnosis has to be made from ovarian and uterine tumours—particularly myomata, from ascites, flatulence, phantom tumours, etc. The menstrual history, the time occupied by the growth of the tumour, the absence of foetal parts, and the possibility in some cases of separating the tumour from the uterus, will usually suffice to make the diagnosis. In *pseudocyesis* (πσεύδος, false; κνήσις, pregnancy) the abdomen is resonant, and, if an anæsthetic is administered, the tumour disappears.

When a diagnosis has been made of the existence of pregnancy, we have to decide how far pregnancy has advanced. This can be accomplished by various methods, none of them, unfortunately, being very exact. The first way that naturally occurs to us is to count the

weeks that have elapsed since the last menstruation. This method, although uncertain, will usually bring us within a fortnight of the true period, if the woman's history is correct. We can confirm this by inquiring the date at which quickening occurred, especially in multiparae, who are naturally more skilled in detecting fetal movements. Quickening usually takes place about the eighteenth week, but here again there may be an error of about a fortnight, too much or too little.

Perhaps, more reliable than either of these methods is the information given by the height of the uterus. If the pelvis of the patient and the size of the uterus are normal, then by noting the height of the fundus we can tell at once what month of pregnancy she has reached (*v.* page 83).

By comparing the results obtained by the foregoing methods the period of pregnancy can be estimated tolerably exactly, and the chance of errors in the patient's history eliminated as far as possible.

Assuming that the height of the uterus tends to prove that the menstrual history may be relied on, we can tell approximately the date of delivery by the methods of Naegele or Matthews Duncan. Pregnancy is usually divided into ten menstrual periods of four weeks each, that is 280 days. Naegele counted from the first day of the last menstruation. He subtracted three months from that date, then added seven days, or in leap year six days if February were included in the time, and counted forward a year. For instance, if the patient last began to menstruate on July 1st, count back three months, to April 1st; then add seven days, to April 8th; count forward a year; and the result will be the date of delivery. The method of Matthews Duncan is slightly different. He counted from the last day of last menstruation, and added on nine months and three

days to it. If the menstruation which began on July 1st ended on July 5th, then nine months and three days added on brings the date to April 8th again.

When the menstrual history is unsatisfactory or cannot be obtained, we must base our calculation of the date of delivery on the height of the uterus at the time of examination. In order to facilitate this calculation, we have devised a table which enables the date of delivery to be ascertained with very tolerable accuracy in a few moments. This table will be found in the appendix.

Reckoning from the date of *quickening*, *i.e.* the day on which the mother first feels the movements of the foetus, and supposing quickening to occur at the eighteenth week, by adding on twenty-two weeks we get the required date. The date thus found must not be considered absolute; it is the centre of a month during which delivery will probably occur.

The last question to be decided is, whether the foetus is alive or dead. Of course, the fact that pregnancy is continuing is usually an indication that the foetus is alive. The death of the child is usually followed by the onset of labour, but sometimes the ovum may be retained in the uterus. If the patient is past the sixth month, and still no heart can be heard on the most careful and repeated auscultation, the foetus is probably dead. If the woman has felt the child frequently, and one day noticed unusually active movement, and after that a complete cessation of movement, the foetus is probably dead. Lastly, if in conjunction with these symptoms we find that a uterus, which steadily increased in size up to a certain day, has ceased to increase any further, and rather is diminishing in size, the diagnosis is complete.

The woman's symptoms are also of importance. If

the child has been dead for any length of time, she begins to lose her appetite and to become thinner and weaker. She complains of a disagreeable taste in her mouth, and her face assumes a yellowish tinge. Then, on making a vaginal examination it may be possible to feel the cranial bones loose and movable under the skin. If the membranes have ruptured, the fœtus decomposes and a fœtid discharge comes away from the vagina.

THE MANAGEMENT OF PREGNANCY.

As pregnancy is a physiological and not a pathological condition, it follows that its management is, in the main, merely an amplification of what ought to be the ordinary hygienic precautions of a woman's life. The great—and for a healthy woman—the only necessity, is to live during pregnancy as far as possible in conformity with the dictates of nature. Her diet should consist of simple wholesome food, without either undue restriction or excess. The same remarks apply to her drink. Excessive drinking of tea or coffee must be as consistently forbidden as is excessive indulgence in other stimulants. The regular action of the bowels must be obtained most carefully, particularly by the use of such articles of food as have an aperient effect. Attention must also be paid to the action of the kidneys, and any decrease in the amount of urine carefully noted. Baths ought to be taken to at least the extent necessary for perfect personal cleanliness. If possible the patient should take a daily bath, but all extremes of temperature must be avoided. In addition, the external genitals should be bathed night and morning with warm water. Vaginal douching should not be permitted unless there is a necessity for it, such as the occurrence of leucorrhœa.

If it is necessary, the douche should be administered at a temperature of 98° F., and at a low pressure. In the matter of dress, all garments which exert an undue pressure on any part of the body must be forbidden, particularly tight corsets, garters, or strings round the waist. In most cases the use of a properly adjusted abdominal belt is of value, as it supports the abdominal wall; in pluriparous women, with lax or separated recti muscles, it is a necessity. It must not, however, be worn too tight. Regular exercise in the open air should, so far as possible, be taken daily. Its character will depend largely on the position and previous habits of the patient, and on the nature of her previous pregnancies—if she is a multipara. In those cases in which previous abortions or hæmorrhages have occurred, special care must be taken to avoid sudden and violent movements. Long standing, excessive or too violent exercise, or the undue prolongation of exercise, must be avoided in all cases. Coitus should be as restricted as possible, and in the case of patients who have had previous abortions, it should be forbidden. The mental condition of the patient must be carefully watched, and all causes of melancholy, irritation, and fright avoided as far as possible, while her surroundings should be such as will promote happiness and an even temperament.

The due care of the breasts is a most important point, especially in primiparæ. The physician should examine the nipples to ascertain if they are of a shape suited for nursing. If they are at all depressed, the mother must be taught to draw them out gently with her fingers several times a day, taking care not to use undue force, and to have perfectly clean fingers. Too violent attempts at forming the nipple, especially when they are made by an unskilled nurse, often result in causing slight lacerations in the delicate skin. Then, if the

fingers or nipples are dirty, the cracks become infected, and mastitis may follow. In addition to forming the nipples, the patient must bathe them, during the last three months, a couple of times daily, with some lotion which will harden the skin, as otherwise a strong and healthy child will cause great pain whilst nursing. The usual lotion used is alcohol in some form—*Eau de Cologne*, whisky, or common methylated spirits. Begin with a weak solution and gradually increase the strength. Pure whisky may be used, but *Eau de Cologne* must be diluted by adding an equal volume of water. Lano-line may also be rubbed into the skin to make it elastic.

CHAPTER VII.

LABOUR AND ITS PHENOMENA.

Definition of Labour—Causes—Stages—Phenomena, Uterine Contractions, Accessory Muscles of Labour, Effect of Uterine Contractions—Symptoms, Normal Labour, Abnormal Labour—Diagnosis.

Definition.—Labour is the term applied to the process which severs the connection between the mother and the ovum, and removes the latter from the organism of the former (Winckel). The process is classified as follows :—

- (1) *Abortion*, when it occurs before the formation of the placenta, *i. e.* before the beginning of the fourth lunar month.
- (2) *Partus immaturus*, or *miscarriage*, when it occurs after the formation of the placenta, but before the child is viable, *i. e.* from the beginning of the fourth to the end of the seventh lunar month.
- (3) *Partus prematurus*, or *premature birth*, when it occurs after the child has become viable, but before full term, *i. e.* before the end of the tenth lunar month.
- (4) *Partus maturus*, or *full-term birth*, when it occurs at the end of the tenth lunar month.
- (5) *Partus serotinus*, or *delayed birth*, when it occurs more than forty-one weeks after conception.

At present we are concerned only with *partus maturus*, or full-term birth.

Causes.—It is little known what the factors are which cause a pregnant uterus to contract at the tenth menstrual period after conception, and to expel its contents. So far, our views are but the results of conjecture. We know that certain changes occur during pregnancy, and we infer a consequence from them. What these changes are we shall state in a few words :—

1) The uterus and ovum increase in size during pregnancy. In the earlier months the uterus grows more rapidly than the ovum, but in the later months the ovum grows faster than the uterus. Hence it comes about that, towards the end of pregnancy, the growing ovum gradually becomes too large for, and so exerts a distending pressure upon, the uterus. The uterine muscle in turn reacts against this pressure, and drives the ovum against the internal os, which in consequence begins to dilate.

2) During the entire period of pregnancy, the uterus shows a certain amount of irritability and a tendency to contract intermittently. This irritability is especially marked at the menstrual period, and becomes more marked with each successive period. It shows itself by the painless contractions of the uterus—an intermittent series of contractions which can be felt by laying the hand upon the uterus, especially in the later months of pregnancy.

3) The cells of the decidua vera undergo a partial necrosis towards the end of pregnancy.

(4) During and after the fifth month, large multinucleated masses derived from the syncytium appear in the decidua basalis. These masses increase in number, and about the eighth or ninth month are said to grow

into the veins which carry the return flow of blood from the placental sinuses, and so obstruct the flow through them. As a result the blood in the sinuses contains an increased quantity of CO_2 gas.

(5) There is one motor centre for uterine contraction in the medulla oblongata, and excess of carbonic acid gas in the general circulation of the mother stimulates it. The rapidly growing foetus daily extracts more oxygen from the maternal blood, and returns, instead of it, a daily increasing quantity of carbonic acid gas, thus furnishing the excess of CO_2 necessary to stimulate the centre in the medulla. Direct stimuli applied to the uterus also cause contraction by means of a reflex centre in the spinal cord, and the CO_2 in the uterine sinuses here acts as the stimulus. On the other hand, it may be that it is not the excess of CO_2 so much as the diminution of oxygen that acts thus (Runge).

These are the facts which we know. What conclusions may we draw from them? We have a series of changes occurring in the uterus and its contents, changes that become more marked daily as pregnancy advances. The uterus is becoming more and more distended by the growing ovum, and one day it must become over-distended. The irritability of the uterine muscle is increasing daily, and is tending to cause a separation between the ovum and the uterus. The necrosis of the decidual cells is paving the way for this separation to occur more easily. Once it occurs, the ovum becomes a foreign body, and is expelled. The outgrowth of syncytial masses causes a venous condition of the blood in the uterine sinuses, a condition which furnishes an ever-increasing peripheral stimulus to the centres in the cord. The growth of the foetus, daily abstracting more oxygen from the mother, causes a daily increasing excess of CO_2 in the

maternal blood, so furnishing the necessary stimulus for the medulla. All these are predisposing factors; and ever increasing, apparently come to a climax at the tenth menstrual period. An exciting cause is furnished by some sudden movement—straining at stool, a violent cough, or the like; the period of unstable equilibrium comes to an end and labour begins.

Stages.—Labour is divided into three stages:—

- (1) The first stage, or stage of dilatation.
- (2) The second stage, or stage of expulsion.
- (3) The third stage, or placental stage.

The first stage begins with the onset of true labour pains, and lasts until the full dilatation of the os and the rupture of the membranes. Its average length is, in primiparæ, about eleven to twelve hours; in multiparæ, about six to eight hours. The second stage begins with the full dilatation of the os, and ends with the expulsion of the child. Its average duration is from one to two hours in primiparæ, and from ten to fifteen minutes in multiparæ. The third stage begins after the birth of the child, and ends with the expulsion of the placenta. Its length varies greatly according as it ends spontaneously, or is ended artificially. If the expulsion of the placenta is left to the natural efforts, the average duration of this stage would be about three hours, but, if the usual method is adopted of expelling the placenta as soon as it is detached, the average duration is from twelve to fifteen minutes.

THE PHENOMENA OF LABOUR.

Before discussing the various phenomena of labour, we shall define certain terms which will be frequently used. These terms are as follows:—

Contraction.—The temporary shortening which occurs in a muscle-fibre in response to a stimulus conveyed to it by an efferent nerve.

Retraction.—The permanent shortening of the muscle-fibre which persists after the contraction has passed off.

Relaxation.—The condition of the muscle-fibre in the absence of contraction.

Polarity of the uterus.—The correlation which exists between the contractions of the muscle fibres of the fundus and the relaxation of the fibres of the cervix of the uterus. Prior to the onset of labour, the muscle-fibres of the body of the uterus are relaxed and those of the cervix contracted. After the onset of labour, the contractions of the muscle-fibres of the body are accompanied by a relaxation of the fibres of the cervix.

Uterine orifice.—The term is used to denote the passage which lies between the uterine cavity and the vagina at any stage of labour. At one time this passage comprises the entire cervical canal, while at other times it only includes portions of the canal according to the amount of dilatation which has occurred (*v.* Fig. 43).

The taking up of the cervix.—This is the term applied to the gradual process by which the cervical canal is made continuous with, and so part of, the lower uterine segment.

It will probably help the student to understand the phenomena of labour if we briefly summarise these phenomena in a short account of the process of labour. At the beginning of labour, the fœtus floats in the liquor amnii in a closed sac formed by the membranes, and this sac in turn is contained in another closed sac—the uterus. The connection between the sac formed by the membranes and the investing uterus is but slight, save at one point—where the placenta is

attached to the uterine wall, and here large blood-vessels pass from the uterus into the placenta. In

order that the foetus may escape from the sac in which it is contained, the membranes must rupture, and, in order that it may pass out of the investing uterus, the cervical canal must dilate to a sufficient size to allow it to pass through. Further, a powerful force is necessary in order to expel the foetus from the uterus, and to overcome the resistance which is offered to its passage by the maternal tissues. Finally, the placenta has to be detached and expelled from the uterus, and, as this occurs, some mechanism has to come into play which will obliterate the blood-vessels, and so prevent the hæmorrhage which would otherwise occur.

These various changes are brought about as follows :

With the beginning of labour intermittent contractions of the uterus occur, with the result that the ovum is compressed. The compressing force is greater above and at the sides, and least below, and, consequently, the ovum bulges downwards against the lower portion of the uterus. At the same time the polarity of the uterus shows itself, and the fibres of the cervix relax. Then, as a result of the pressure of the ovum and of the relaxation of the cervical fibres, the uterine orifice slowly dilates. As soon as this dilatation has reached a stage sufficient to allow the head to pass through, the membranes tear, in consequence of the pressure transmitted to them from the uterine contractions, and of the loss of the previous support which they received from the lower pole of the uterus and the walls of the cervix. The first stage of labour is now said to be complete ; the passage through which the foetus is to pass is open ; and the second stage begins.

From this time on, the uterine contractions, instead of merely causing dilatation of the uterine orifice, begin

to expel the fœtus from the uterus, and, in obedience to a natural impulse which calls on her to supplement them, the patient "bears down," or, in other words, she tries by means of the accessory muscles of labour—*i. e.* almost all the important voluntary muscles in her body—to increase the intra-abdominal pressure, and so to increase the force which is driving the fœtus out of the uterus. As a result of these forces, the fœtus is driven into the pelvis, where room has been in part already made for it by the displacement upwards of certain of the pelvic structures—notably the bladder. As the fœtus descends, it makes more room for itself by driving the greater part of the remaining structures downwards before it. The relations of the parts of the bony pelvis also undergo certain alterations, which cause a temporary increase in various diameters. The presenting part then reaches the vulva, and, passing through the latter, is born, and is quickly followed by the rest of the body. With the birth of the fœtus, the second stage is completed.

The third or final stage of labour then begins, and consists of the expulsion of the remainder of the ovum—*i. e.* the placenta and the membranes. This process is again brought about by the contractions of the uterus, as a result of which the uterus diminishes so much in size that the placenta is detached, and is expelled from the uterine cavity, while as a result, not only of the contraction of the uterus, but still more of the retraction, the blood-vessels which run into the placenta are so compressed and kinked that any further hæmorrhage through them is prevented.

We thus see that the principal phenomenon of labour, to which almost all the other phenomena are due, is the occurrence of uterine contractions, helped by the contractions of the accessory muscles of labour.

The Contractions of the Uterus.—From an obstetrical point of view, the uterus is composed of three parts or zones :—

1) *An Upper Zone—the Upper, or the Contractile, Uterine Segment.*—This zone contains that portion of the uterine muscle whose contractions effect the expulsion of the foetus. It is composed of fibres which run in all directions, and is completely covered by firmly attached peritoneum.

2) *A Lower Zone—the Lower, or Non-contractile, Uterine Segment.*—This zone lies between the upper uterine segment and the inner os. The junction between the upper and lower segments is termed the "retraction ring," and corresponds to the place at which the structure and arrangement of the muscle fibres of the upper segment end (*v.* Fig. 46). The muscle fibres of the lower zone are very loosely connected with one another, and run some circularly and others longitudinally. In accordance with the property of so-called polarity of the uterus, the circular fibres of the lower zone relax as those of the upper uterine segment contract, while the longitudinal bands, by their contractions, draw the cervix upwards over the advancing ovum.

3) *The cervix.*—This zone comprises that portion of the uterus which lies below the inner os. It contains circular fibres, which act similarly to those found in the lower segment.

Accordingly, we see that the uterus is a most complexly formed hollow muscle. During pregnancy the fibres are in a condition of relaxation, with the exception of the circular fibres of the cervix which are in tonic contraction. As soon as labour begins the condition is reversed. The fibres of the upper segment and the longitudinal fibres of the lower segment con-

tract, and the circular fibres of the lower segment and of the cervix simultaneously relax.

The contractions of the uterus possess four characteristics :—They are intermittent, peristaltic, involuntary, and painful.

At the beginning of labour contractions occur only at long intervals, a period of perhaps an hour elapsing between each. As the first stage proceeds, they become more frequent, and, on an average, occur every twenty minutes during the taking up of the cervix, and every two to three minutes during the dilatation of the uterine orifice. During the second stage they occur at first every five to ten minutes, and increase in frequency until during the birth of the fetus they are almost continuous. After delivery, the contractions, as a rule, cease for from five to fifteen minutes, and then recur every five minutes or so, until the placenta has been detached and expelled from the uterus. The duration of a contraction varies according to the stage of labour. At the beginning of labour a contraction lasts a few seconds, and gradually increases in duration until during the second stage it lasts from thirty to ninety seconds.

It is probable that the uterine contractions are peristaltic in character, but this has not been definitely determined, and, even those who believe in their peristaltic nature have not agreed upon the direction in which the wave travels. According to some, it begins at the cervix and passes upwards, but the more general opinion is that it begins in the region of the tubes and passes downwards towards the cervix.

The involuntary character of the contraction is common to all unstriated muscle fibre. The occurrence of contractions is, however, affected by psychical influences, such as may arise from the presence of a

stranger in the room, dread of pain, and such-like causes.

The painful nature of uterine contractions—a fact to which the term “pain” as applied to these contractions owes its origin—is one of their most marked characteristics. The pain occurs at the height of the contraction, which begins and ends painlessly. Its site, cause, and nature vary according to the period of labour. The preliminary pains — *dolores presagientes* — which usually usher in labour are very irregular in their occurrence, and are felt over the abdomen generally. They are not severe in character, and are probably due to the increased force of the hitherto painless uterine contractions and to beginning dilatation of the cervix. During the first stage of labour the pain is principally referred to the region of the sacrum, and, to a slighter extent, to the sides of the uterus. It is chiefly due to the stretching of the cervix, and to a less extent to the contractions of the uterus, and is of a dull and aching character. With the advent of the second stage, and the increase in the strength of the uterine contractions, the pain becomes more severe. It is felt in the uterus, due to the compression of nerves situated in the uterine wall; in the sacrum and pelvis generally, due to the stretching of the vagina and perinæum; and in the thighs and legs, due to pressure upon the sacral plexus. During this stage the pain grows in severity, and reaches a climax during the passage of the head over the perinæum, when it is described as being of a violent tearing or cutting character. During the third stage the pains are felt principally in the uterus, and are probably due to the compression of the uterine nerves. As a rule they are not severe.

The round ligaments contract synchronously with the uterine muscle, of which they must be regarded as

an extension. Their effect is to draw the uterus downwards, and so to counteract the tendency of the fundus to rise upwards.

The Contractions of the Accessory Muscles of Labour.—The accessory muscles, which come to the aid of the uterine muscle during the period of expulsion, consist of almost all the important voluntary muscles of the body. Primarily, they consist of those muscles which can aid in diminishing the size of the abdominal cavity; while secondarily they consist of the muscles of the limbs, which, by fixing the thorax and pelvis, give to the other muscles a *point d'appui*. The effect of the contraction of the auxiliary muscles is to cause a uniform pressure over the body of the uterus, and so both to expel the uterine contents and also to drive the uterus as a whole downwards. This latter action is of importance, inasmuch as it tends to prevent the excessive thinning which might occur in the lower uterine segment if the upper segment was free to rise, as its tendency is, in the abdominal cavity.

The Effect of the Uterine Contractions on the Uterus.—The first effect of the contractions on the uterus is to cause a considerable increase in pressure inside the cavity of the uterus. At the same time, the longitudinal diameters of the uterus are increased, owing to the expansion of the lower uterine segment, the transverse diameters are diminished, and the wall is increased in thickness. If the contents of the uterus were compressible a diminution in the size of the cavity would result, but as they are incompressible an increase of the uterine pressure occurs, with the result that the ovum tends to bulge in whatever direction it is subjected to the least resistance. This area of least resistance is found in the neighbourhood of the os internum, partly because the muscle fibres are fewer at this part of the

uterus than they are elsewhere, and partly on account of uterine polarity, which causes these fibres to relax as the fundus contracts. The continuance of uterine contractions leads to the following important changes :

- 1) The taking up of the cervix.
- 2) The dilatation of the uterine orifice.
3. The expansion of the lower uterine segment.

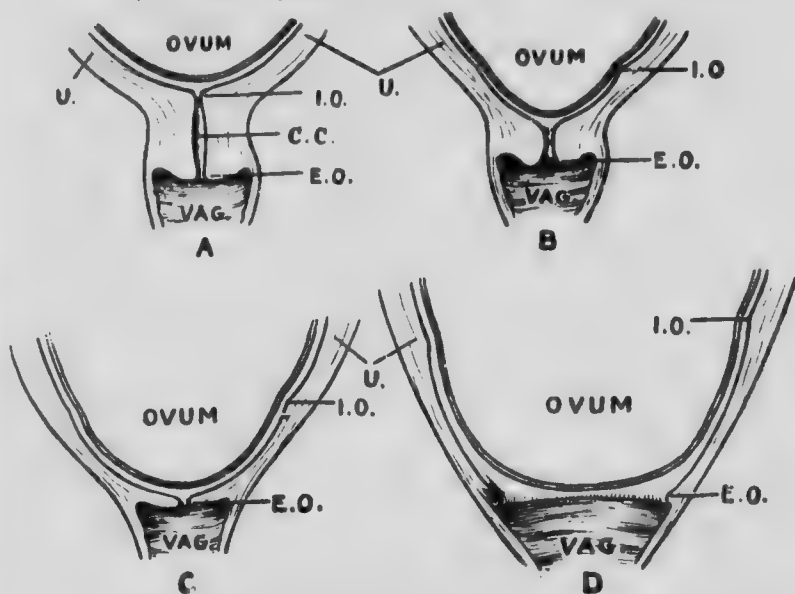


FIG. 44.—Diagrammatic representation of the manner in which the cervix is taken up in the case of a primipara. E.O. Os externum. I.O. Os internum. C.C. Cervical canal. U. Uterus.

- (4) The diminution in size of the upper uterine segment.

1) *The taking up of the cervix.*—The taking up of the cervical canal into the lower uterine segment is a process which differs in detail and in degree in the case of primiparae and multiparae. In both cases, the mechanism by which it is accomplished is similar, and consists first in the gradual softening which occurs in the

cervical tissues during pregnancy; secondly, in the contractions of the longitudinal uterine fibres which draw up the cervix over the advancing ovum; and

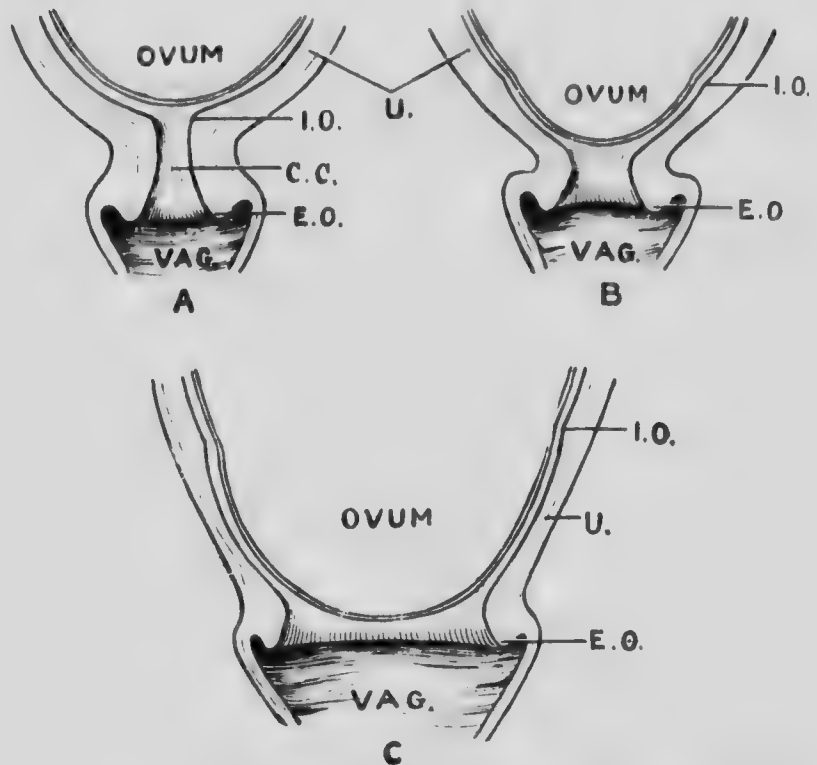


FIG. 45.—Diagrammatic representation of the manner in which the cervix is taken up in the case of a multipara. (The letters are the same as in Fig. 44).

thirdly, in the contractions of the upper uterine segment which drive the ovum downwards.

In primiparae, at the beginning of labour, the cervix presents more or less its characteristic outline and length and both the internal and external os are closed. The process of taking up closely resembles the effect which would be produced by pushing a cone through

the cervical canal from above downwards (*v.* Fig. 44). First, the internal os dilates, and its outline is practically lost. Then the supra-vaginal portion of the cervical canal dilates in a similar manner, and then the infra-vaginal portion. The taking up of the cervix is now complete, the uterine and cervical cavities are continuous with one another, and the uterine orifice is alone enclosed by the thinned-out edges of the external os.

In multiparæ, on the other hand, the cervix at the beginning of labour has lost its original contour to a varying extent. The external os is already patulous, and will admit one or two fingers, so that whereas in primiparæ the upward passage of the examining finger is checked by the resistance of the external os, in multiparæ it is checked by the resistance offered by the supra-vaginal portion of the cervix, or even by the internal os. This is probably due to the increased degree of softening which is present in these cases, and also to the effect of former lacerations of the cervix. In such cases the taking up of the cervix is not so complete as in primiparæ (*v.* Figs. 44, 45). The first step consists in the dilatation of the internal os, followed by the dilatation of the supra-vaginal portion of the cervical canal. The process of taking up is now complete, and the uterine orifice is enclosed by the greater part of the infra-vaginal portion of the cervix. Consequently, whereas in primiparæ the uterine orifice is encircled by the thin, almost paper-like, edges of the os externum, in multiparæ it is encircled by blunt, comparatively thick edges, formed by the lower half of the cervical tissue.

2) *The dilatation of the uterine orifice.*—The dilatation of the uterine orifice is brought about by the distending pressure exerted on its edges by the descending column, and by the contractions of the longitudinal bands

of muscle fibre, which draw the remaining portions of the cervix upwards. As soon as this upward retraction of the cervix is so complete that almost all trace of cervical projection has disappeared, dilatation is complete, and the utero-cervical and vaginal cavities are continuous. During the dilatation of the cervix, the cervical glands pour forth large quantities of mucus, which materially facilitates the expulsion of the fœtus

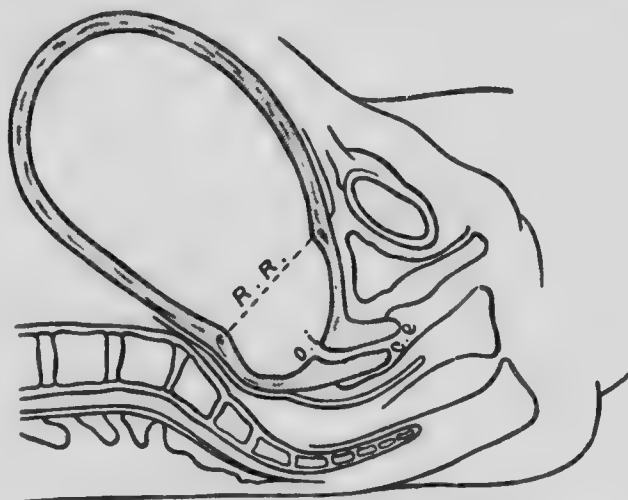


FIG. 46.—The position of the retraction ring at the beginning of labour.
R.R. Retraction ring. o.i. Internal os. o.e. External os.

by its lubricating effect on the walls of the genital canal.

(3) *The expansion of the lower uterine segment.*—The changes which take place in the lower uterine segment during labour are of the greatest practical importance. At the beginning of labour, the lower uterine segment comprises the zone between the retraction ring and the os internum, and is about $2\frac{1}{4}$ inches in depth. When the taking up of the cervix is complete, the lower uterine segment is increased in size by the

added portion of the cervical tissue. Above the retraction ring, the uterine muscle contracts and retracts during labour. Below it, the muscle relaxes, with the exception of the longitudinal bands, which draw the cervix upwards. With each contraction of the uterus the capacity of the upper segment diminishes, while the capacity of the lower segment increases owing to the descent of the ovum. The combined effect of these

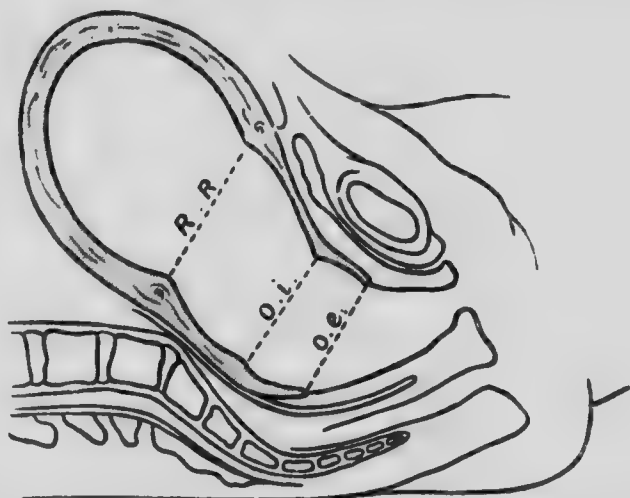


FIG. 47.—The position of the retraction ring after an unduly prolonged labour. *R.R.* Retraction ring. *o.i.* Internal os. *o.e.* External os.

changes in the upper and lower segments is to produce an actual elongation of the uterus, which persists even after the head has passed completely into the pelvis.

At first the diminution in size of the upper segment occurs and passes off with each contraction; but, as labour continues and retraction becomes more marked, each contraction leaves the cavity of the upper segment slightly smaller than it was before. It is obvious that, so long as the fetus is completely contained in the uterus, this gradual diminution in size of the upper seg-

ment must be accompanied by a corresponding increase in size in the lower segment. This increase, under normal circumstances, is obtained by the taking up of the cervix, and as soon as this process is complete and the uterine orifice dilated, the advance of the fœtus renders further expansion unnecessary. If, however, there is any obstacle to the birth of the fœtus, then the progressive retraction of the upper segment necessitates an increased amount of expansion of the lower segment. The greater this obstacle is, and, consequently, the longer labour continues, the greater will be the increase in size of the lower segment, until, finally, if labour continues sufficiently long, the lower uterine segment becomes so thinned by expansion that it yields to the pressure of the fœtus, and a rupture of the uterus occurs (*v.* Fig. 170). In normal cases the retraction ring, *i. e.* the junction between the upper and lower uterine segments, is not apparent, but in cases of prolonged labour it may be felt through the abdominal walls as a depression running obliquely across the uterus, at first a little above the symphysis, and, finally, perhaps in the region of the umbilicus (*v.* page 61). Accordingly, we see that the position of the retraction ring, if it can be ascertained, affords important information as to the effect of the contractions on the uterine muscle fibre.

The functions of the lower uterine segment are two in number. In the first place, as will be readily understood, unless it existed the uterine contractions could not bring about the expulsion of the fœtus. If the entire uterus had an identical arrangement of muscle fibre, the contraction of the latter would merely tend to compress the ovum. When, however, the lower segment of the uterus contains fibres which apparently act in a reverse manner to the fibres of the upper segment, and so provide a place into which the

contractions of the latter can drive the ovum, its expulsion from the uterus is possible. Consequently, the first function of the lower segment is to facilitate the expulsion of the fœtus.

The second function of the lower uterine segment is to form a ring, which prevents the descent of the presenting part until the uterine orifice is sufficiently dilated to allow it to pass. Into this ring the presenting head is driven by each contraction in such a manner that the two together act as does a ball-valve. This action is very important. Prior to each contraction of the uterus, the liquor amnii which surrounds the body of the fœtus is in free communication with the liquor amnii which lies in front of the head. If this communication persisted during a contraction, the result would be that a quantity of liquor amnii would be forced in front of the head, and that in consequence, the tension on the membranes lying over the dilating cervix would be so great that they would rupture long before the uterine orifice was fully dilated. Instead of this, however, each contraction drives the head so firmly into the embrace of the lower segment that all communication between the hind-waters and the fore-waters is temporarily shut off, and that, consequently, the tension on the membranes is not increased in proportion as the head descends. This ball-valve action is further of importance at the time the membranes rupture, inasmuch as it prevents the escape of the liquor amnii which surrounds the body of the fœtus. But, for it, as soon as the membranes ruptured, the liquor amnii would all flow away and, perhaps, carry down the cord.

(4) *Diminution in the size of the upper uterine segment.*—As we have already seen, contraction of the uterine muscle during labour results in a temporary diminution in size of the upper segment and the

consequent expulsion of the fœtus, while retraction results in a permanent and progressive diminution

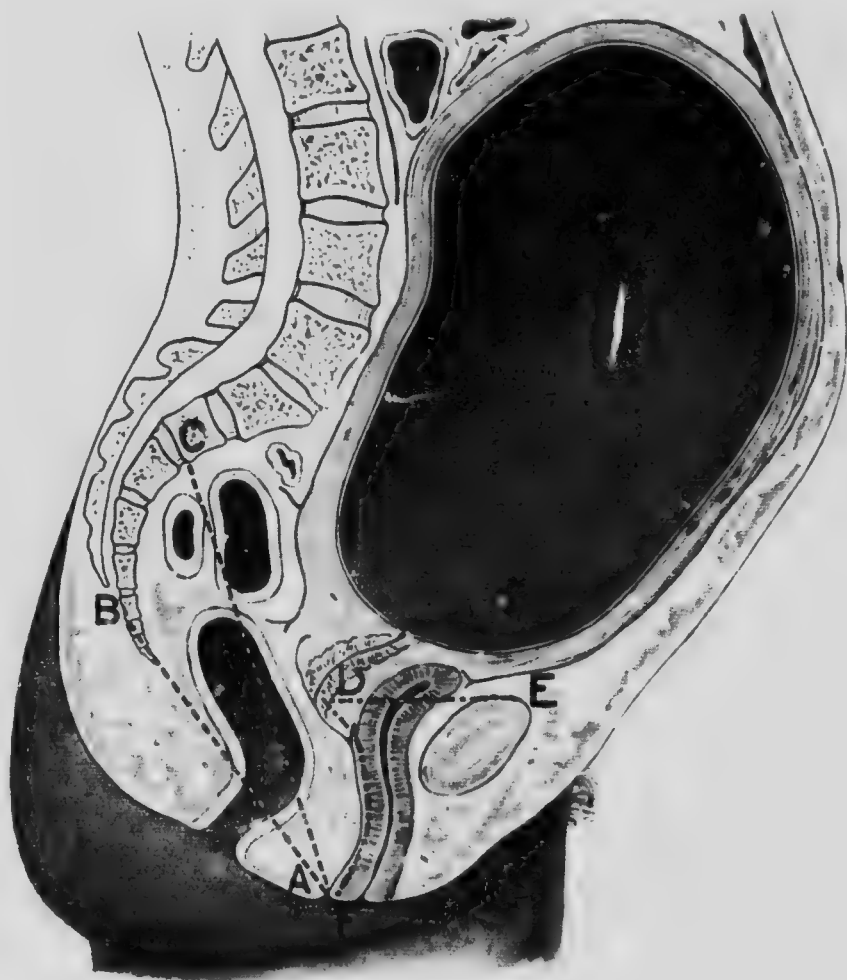


FIG. 48.—Median section of the pelvis and uterus just before labour. A, B, C. The posterior triangle which is pushed downwards in front of the advancing head. D, E, F. The anterior triangle which is in great part drawn upwards over the advancing head.

and the consequent adaptation of the uterus to its lessened contents. Accordingly, during the first and second stage, the uterine cavity becomes smaller as the foetus is expelled, and its walls at the same time increase in thickness; during the third stage the cavity is only sufficiently large to contain the placenta; while, subsequent to the expulsion of the latter, the cavity is only potential. The effect on the uterine vessels, of the diminution which occurs after delivery, is obvious. During the period of a contraction, the uterine vessels are temporarily compressed and twisted, and, as a result of retraction, their permanent obliteration is effected. During the process of detachment of the placenta, however—that is, before retraction is complete—some loss of blood normally occurs. The average amount is said to be four ounces before the expulsion of the placenta, and six ounces with the placenta and membranes.

The Effect of the Uterine Contractions on the Pelvic Contents and Perinæum.—The manner in which the pelvic cavity is temporarily emptied of its contents, in order to afford room for the passage through it of the foetal head, constitutes one of the most interesting phenomena of labour. The contents of the pelvis, as seen in antero-posterior section, are so arranged as to form two triangles, separated from one another by the vaginal slit—an anterior and superior triangle, and a posterior and inferior triangle (*v.* Fig. 48). The structures contained in the anterior triangle are intimately connected with the cervical tissues, while the structures contained in the posterior triangle are quite independent of any uterine connections. As the cervix is drawn upwards by the contraction of the longitudinal bands of muscle fibre, it draws up with it the greater part of the structures in the anterior triangle. In this manner the bladder, which at the beginning of labour lay, if empty,

entirely below the pelvic brim, is drawn up out of the pelvis into the abdomen. The structures in the anterior

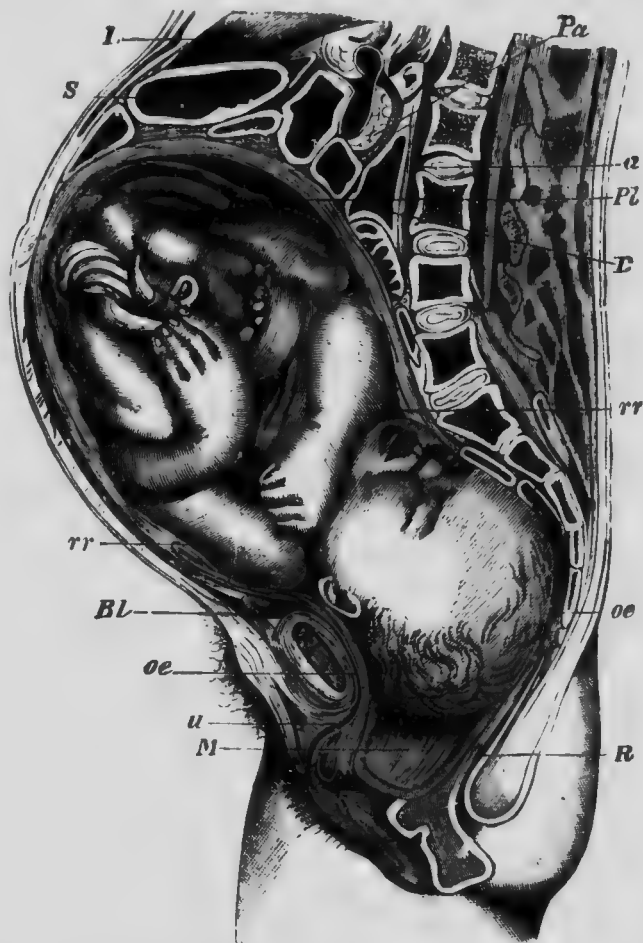


FIG. 49.—Frozen median section of a patient who died in labour at the end of the first stage. *L.* Liver. *S.* Stomach. *Pa.* Pancreas. *D.* Duodenum. *a.* Aorta. *Pl.* Placenta. *rr.* Retraction ring. *Bl.* Bladder. *oe.* Os externum. *u.* Urethra. *M.* Membranes. *R.* Rectum. (*Braun.*)

triangle, which are not connected with the cervix, viz., the lower third of the vaginal wall and the urethra are

pushed downwards in front of the presenting part. As the presenting part descends it pushes before it the pos-

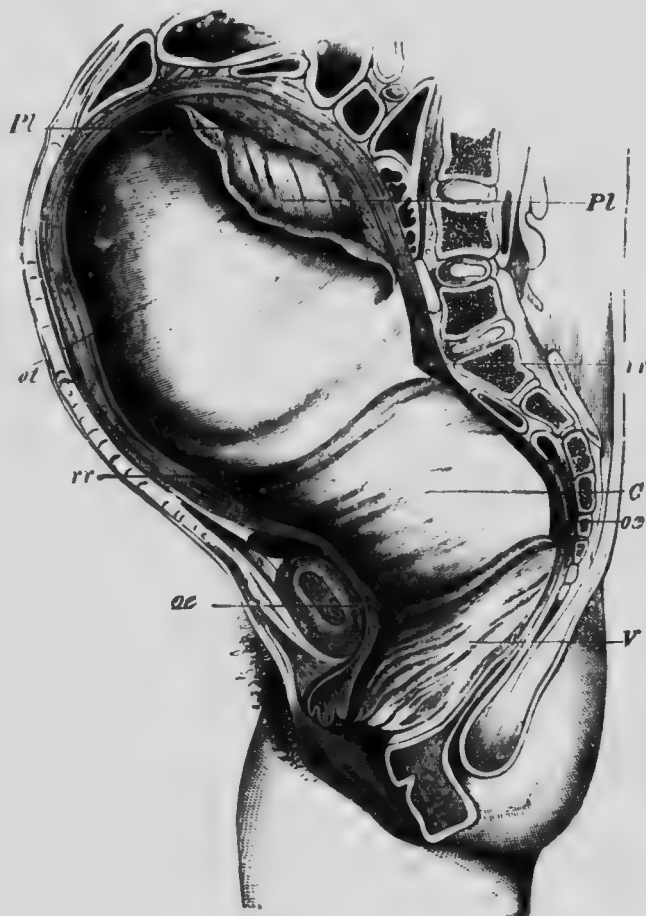


Fig. 50. —The same section as Fig. 49, the fetus being removed. *Pl.* Placenta. *rr.* Retraction ring. *C.* The lower uterine segment and the cervical cavity. *oe.* Os externum. *V.* Vagina. This section shows also the condition of the pelvis after the removal of its contents as has been described. (*Braun*)

terior triangle, which, as we have mentioned, is unaffected by the retraction of the cervix. In this

manner the lower portion of the rectum, the perinaal body, and the muscles of the pelvic floor are pushed down by the presenting part (*v.* Figs. 48, 50).

As the presenting part descends, it obstructs the return flow of blood in the veins, and the consequent rise in intra-venous pressure, aided by the natural hyperæmic condition of the vaginal mucous membrane, causes a serous transudation from the vessels into the peri-vaginal and perinaal tissues and on the surface of the vaginal mucous membrane. This transudation renders the tissues more distensible, and so capable of dilating to the necessary extent without laceration. Further, by increasing the amount of vaginal discharge, it reduces the friction between the vaginal mucous membrane and the skin of the fœtus to a minimum.

The Effect of the Uterine Contractions on the Pelvic Joints and Ligaments.—All the cellular and connective tissue of the pelvis becomes softened, cedematous, and hypertrophied during pregnancy. The various pelvic ligaments undergo a similar change, especially just prior to parturition. These changes enable an increased amount of movement to take place at the various joints, and the mobility of the sacrum especially is increased. The pressure of the fœtal head when passing the brim is thus enabled to drive the base of the sacrum backwards, increasing thereby the conjugate diameter of the brim and diminishing that of the outlet. Later, when the head has descended further, the lower portion of the bone is driven upwards and backwards, and the outlet is widened, while at the same time the promontory projects more prominently forwards. Even greater relaxation occurs at the symphysis pubis, and sometimes at the end of pregnancy the pubic bones can be made to move upon one another at this articulation. During labour the bones

become slightly separated, and thus increase the size of the pelvic inlet.

The Effect of the Uterine Contractions on the Ovum.—As we have seen, the first effect of the uterine contractions on the ovum is to cause the latter to bulge in the direction of least resistance. At the same time, the lower uterine segment is drawn upwards over the ovum, and so there is a separation, to a greater or less extent, of the membranes from the underlying decidua,



FIG. 51.—Diagram representing the effect of "general contents' pressure" after rupture of the membranes.

a process which is accompanied by slight bleeding. This blood, mingled with the mucus which comes from the cervical glands, produces the so-called "show" which usually ushers in labour. Another result of this detachment of the membranes is the formation of the so-called "bag of membranes," the term applied to that part of the membranes which is felt protruding through the uterine orifice during labour. No further change takes place in the ovum until the dilatation of the cervix is complete. Then, in consequence of the loss of support which the undilated portion of the cervix

previously furnished, the membranes rupture, and the liquor amnii, in front of the presenting part, escapes.

The manner in which the force of the uterine contractions is transmitted to the foetus varies according to the relation of the foetus to the investing uterus. The contractions of the uterine muscle result in an increase in the intra-uterine pressure, and hence in the creation of a force which is sometimes termed the "*general intra-uterine pressure*" or the "*general contents' pressure*." If the foetus is floating in the liquor amnii, the membranes being unruptured and the presenting part still unfixed, this force acts as a general and uniform pressure over all parts of the foetus, and consequently does not tend to alter the position of the latter. If, however, the presenting part is fixed in the pelvis, and is of such a nature that it can completely fill the lower uterine segment, then the contraction of the longitudinal bands of muscle fibres draws the lower segment upwards until there is a girdle of contact all round between it and the presenting head. As soon as this occurs, the hind-waters are shut off from the fore-waters and the "*general contents' pressure*" is only transmitted to the foetal body and such part of the head as is above this girdle of contact (*v.* Fig. 51). The result is that a force equal to the general intra-uterine pressure acts on the part of the head which is above the girdle of contact, and tends to drive it downwards. This force acts uniformly over the base of the head, and consequently does not tend to alter the relation of the head to the body, but solely to drive the head directly downwards.

When, however, the liquor amnii has in part escaped and the uterine wall is in contact with the foetal body, a direct uterine pressure on the body results, and another force, which, from its tendency to restore the uterus to its original form, is known as "*form-restitution force*,"

comes into play. The circular fibres of the uterus contracting strongly, cause a diminution in its transverse and antero-posterior diameters, and so exert a lateral pressure upon the fœtus. This pressure tends to straighten the fœtal body and brings about an actual increase in its length of about an inch and a quarter. This brings the fundal pole of the fœtus into contact with the fundus of the uterus, with the result that the contractions of the longitudinal fibres produce a force which acts directly downwards on the fundal pole (7. Fig. 52).

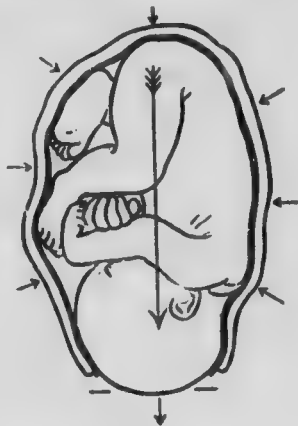


FIG. 52.—Diagram representing "fœtal axis pressure."

The resultant of these two forces—the circular force, which straightens the fœtal body, and the downward force, which acts on its fundal pole—is a force termed "*fœtal axis pressure*," which acts directly down the body of the fœtus and is transmitted to the head through the spinal column. This force, therefore, does not act uniformly over the base of the head, and consequently is capable of producing a change in the relation between the head and the trunk.

As soon as the membranes have ruptured, the contractions of the uterus drive the fœtus downwards.

When the presenting part reaches the pelvic floor it lies on the levator ani muscle, beneath which lies the perinæum. As each contraction occurs, it is driven downwards a little, and, in its descent, forces downwards and forwards both of these structures. Then, as the contraction passes off, the presenting part again recedes, forced upwards by the resisting levator ani muscle. This procedure recurs several times, each time the presenting part coming a little lower than the time before, but each time slipping back again into its former position. Finally, however, there comes a contraction of sufficient strength to drive the presenting part between the lateral divisions of the muscle in such a manner that it is caught above its greatest convexity, and consequently is held in this position. When this occurs the head no longer recedes, but remains in the position into which it was driven by the contraction. The next contraction then is able to drive it out, and during this process the maximum distension of the perinæum occurs. The remainder of the liquor amni accompanies and follows the birth of the fœtus.

The various alterations in the position and the attitude of the fœtus which occur during its expulsion are termed "the mechanism of labour," and as they differ according to the presentation of the fœtus, they will be discussed in the chapters on the various presentations.

In addition to these alterations, changes take place in the shape of the fœtal head as a result of the pressure it undergoes in its passage through the pelvis. These changes are known as the moulding of the head, and result in a diminution of those diameters which are most compressed with a compensatory elongation of those which are not compressed. As has been already shown, the moulding of the head is rendered possible by the presence of the sutures and fontanelles. The

precise changes differ according to the presentation, and will be referred to in their proper place. Speaking generally, however, it may be said that one parietal bone slides under the other, and that the frontal and occipital bones slide under the parietal bones. The cartilage between the squamous and temporal portions of the petrous bone allows the squamous portion to be pressed under the other.

Another change which takes place is the formation of the "*caput succedaneum*," the term applied to the sanguineous swelling which forms on the face of the presenting part of the head above the uterine orifice—in the case of the breech presentation, which the remainder of the body is subjected to. The *caput succedaneum* is formed by a transudation of lymph from the vessels into the tissue of the scalp, with a little added blood due to minute hemorrhages, the result of the laceration of small vessels. Its size depends on the duration of labour and the strength of the uterine contractions. The size of the *caput* varies according to the nature of the presentation and the position of the fetus, and its extent also changes during labour according as the presenting part flexes, extends and rotates. The *caput succedaneum* usually disappears within twenty-four to forty-eight hours. When it forms on the face, marked temporary disfigurement often results, owing to distention of the face, and this may cause the mother considerable anxiety, but, however, only temporary.

The contractions of the uterus return shortly after the birth of the fetus, and cause the detachment and the expulsion of the placenta and the decidua. The exact mechanism by which these processes are effected cannot be regarded as clearly ascertained. The simplest

and commonly accepted explanation is that of Schultze. He considered that the placenta was first detached in consequence of the shrinkage which occurs in the placental site as the uterus contracts down after the birth of the fœtus ; that blood escaped from the uterine vessels into the retro-placental space thus formed, completed the detachment, and at the same time drove the placenta downwards into the membranes with its fetal surface lying lowest ; and that the contractions of the uterus, acting on this hæmatoma, completed the expulsion of the placenta from the upper segment of the uterus. Matthews Duncan, on the other hand, considered that the placenta, after its detachment, was expelled from the uterus with its lower border first, and that it passed through the retraction ring as a button passes through a button-hole.

Schultze's explanation accounts probably for all cases except those in which the placenta extends almost or quite into the lower uterine segment. In such cases a hæmatoma in all probability does not form, or, if it forms, the accumulated blood escapes before there is enough to influence the attachment or position of the placenta, which is probably wholly detached by a slip of the uterine wall upon it. It is probable that, in these cases, Matthews Duncan's explanation of the mechanism of expulsion is correct.

THE SYMPTOMS OF LABOUR.

The symptoms of the patient during labour must be considered under two headings :—

- (A) The symptoms of normal labour.
- (B) The symptoms of prolonged labour.

(A) **Symptoms of Normal Labour.**—The symptoms of the patient at the beginning of the first stage are very

slight, and she may be able to follow her usual occupations, except when a contraction occurs. As the stage advances, the contractions become more frequent, more painful, and last longer. The pulse and temperature remain normal, except for a slight quickening of the former during a pain. At the end of the second stage, and just before the rupture of the membranes, vomiting very commonly occurs.

The symptoms of the second stage are more marked than are those of the first, since the increased strength of the uterine contractions and the descent of the fœtus into the vagina add to the patient's sufferings. The pulse-rate is considerably increased during a contraction, and the rate of respiration is similarly increased immediately after the contraction has passed off. The temperature is often raised from half a degree to a degree. As the fœtus descends and presses upon the rectum, the patient experiences a strong desire to go to stool.

After the birth of the child there is a marked amelioration in the symptoms, so that the patient lies in a restful and contented condition. The temperature usually is at first slightly higher than during the previous stages, while the pulse-rate falls. The uterine contractions return from five to fifteen minutes after the birth of the child, and then recur every few minutes until the placenta is expelled from the uterus. These contractions do not, however, cause any great degree of discomfort to the patient.

(B) **Symptoms of Prolonged Labour.**—It is of extreme importance to recognise the symptoms of unduly prolonged labour as soon as they appear, as serious consequences may occur owing to the patient being allowed to remain too long undelivered.

The earliest indication that labour is unduly prolonged is afforded by the pulse-rate and the tempera-

ture ; and, of the two, the former is the more important. The pulse increases in frequency, and from a rate of 70 to 80 beats per minute, it may attain a rate of anything from 100 to 160 beats. The occurrence of a rise of temperature is not so constant, and does not admit of quite the same interpretation. It usually implies that a slight septic infection of the patient has occurred, due to the decomposition of liquor amnii in the vagina, a condition which, of course, is indirectly the result of the prolonged labour.

The next indication to appear is a change in the character of the uterine contractions. The exact change that takes place differs according to the cause of the prolongation of the labour. If the prolongation is due to some obstruction to delivery, the contractions become more frequent, more violent, and more painful, and finally, losing their intermittent character altogether, become tonic or continuous. As a result of this, the abdomen of the patient becomes extremely tender, and the uterine walls become so firm that it is impossible satisfactorily to palpate the foetal parts. If, however, the prolongation of labour is due to weakness of the contractions or of the voluntary efforts of the patient—a condition which may be primary, or may be the result of long continued efforts to overcome an obstruction, the contractions, instead of becoming stronger, gradually die away, and may entirely disappear. In some cases, they return again after the patient has rested ; in other cases, a condition of "missed labour" results, and a dead foetus is retained in the uterus.

While these changes in the character of the pains are taking place the appearance of the patient also alters. Her face is drawn and anxious and expressive of the degree of intensity of the suffering which she has undergone. Her lips become dry, and sordes accumulate

about them. The tongue becomes dry and coated, and nausea and vomiting may occur.

The remaining symptoms of prolonged labour are as follows :—

- (1) The rising of the retraction ring to a height of more than an inch and a half above the symphysis (*v.* page 124).
- (2) Ballooning of the upper part of the vagina, the result of the retraction of the cervix.
- (3) Dryness of the vagina, due to the failure of the cervical secretions.
- (4) Standing out of the round ligaments, the left of which, as a rule, alone is felt (*v.* page 117).

THE DIAGNOSIS OF LABOUR.

It is often a difficult question to recognise whether or not the patient has entered upon the first stage of labour. Later, when she is having strong labour pains, there is no difficulty in making a diagnosis. Also, in many cases, we may say definitely that the patient is not in labour at the moment of examination, but still we are unable to say that she will not be in labour within the next hour. Often such patients are sent out of a hospital in the morning obviously not in labour, and return the same evening, perhaps as a case of street delivery.

To decide the question, a careful examination of the patient must be made. Begin by palpating the abdomen, and notice if the presenting part is fixed, and if the uterus contracts intermitently. The fixity of the head is a tolerably reliable guide in multiparæ, but is of no value in primiparæ. In the former, as a rule the head does not become fixed until well on in the first stage; in the latter it is fixed for the last three or four

weeks of pregnancy. There are, however, several conditions which prevent the head from fixing at its proper time. These are, speaking generally, anything which either offers an obstruction to the descent of the head, or causes a disproportion between the size of the latter and the size of the brim or cavity of the pelvis (*v.* page 59). In the absence of these conditions, the rule given above may be relied on; and, if we find the head fixed in a multipara, she probably is in labour. If uterine contractions can be felt, find out if the patient complains of pain during them,—that is if the contractions are painful or painless. The presence of painless contractions may be taken as a sure indication that she is not in labour, of painful contractions that she is.

A vaginal examination must next be made, with a view to discovering whether the cervix is dilating or not. If it is only slightly dilated, the patient may not be in labour. One often finds in the case of multiparæ, an external os the size of sixpence a considerable time before labour has set in. In primiparæ, however, the external os does not dilate until the patient has been for some time in labour.

There is one other point of slight importance, namely, the occurrence of the so-called "show," a blood-stained mucous discharge that comes from the cervix and vulvar glands for one or two days before labour sets in. It has been already discussed (*v.* page 131).

One can usually decide whether the patient is in the first or second stage by noting the character of the contractions. In the first stage, the latter are solely uterine contractions, but in the second stage voluntary bearing-down efforts are added. Further, the history of the patient, or a vaginal examination, informs us if the membranes have ruptured or not, and so at once settles the point.

CHAPTER VIII.

CEPHALIC PRESENTATIONS.

Vertex Presentation: Definition, Frequency, *Æ*tiology, Positions, Diagnosis, Mechanism, Abnormal Mechanism, Moulding.

THE term cephalic presentation includes all forms of head presentation (*v.* page 43).

VERTEX PRESENTATION.

Definition.—A vertex presentation is the term applied to that presentation in which the head presents, and the vertex, or space between the anterior and posterior fontanelles, lies lowest (*v.* Fig. 54).

Frequency.—Vertex presentation is said to occur in about 95·53 per cent. of all full-term cases. At the Rotunda Hospital, amongst 35,000 cases of labour occurring after the beginning of the fourth month, vertex presentations occurred in 95·88 per cent. In this number, fontanelle presentations are included.

Ætiology.—The *æ*tiology of vertex presentation has been already discussed under the heading of "Presentations" (*v.* page 41).

Positions.—Four positions are recognised, according as the back of the fœtus lies to the left or right of the

middle line, and is turned forwards or backwards
They are : —

1st position—back to the left and in front.

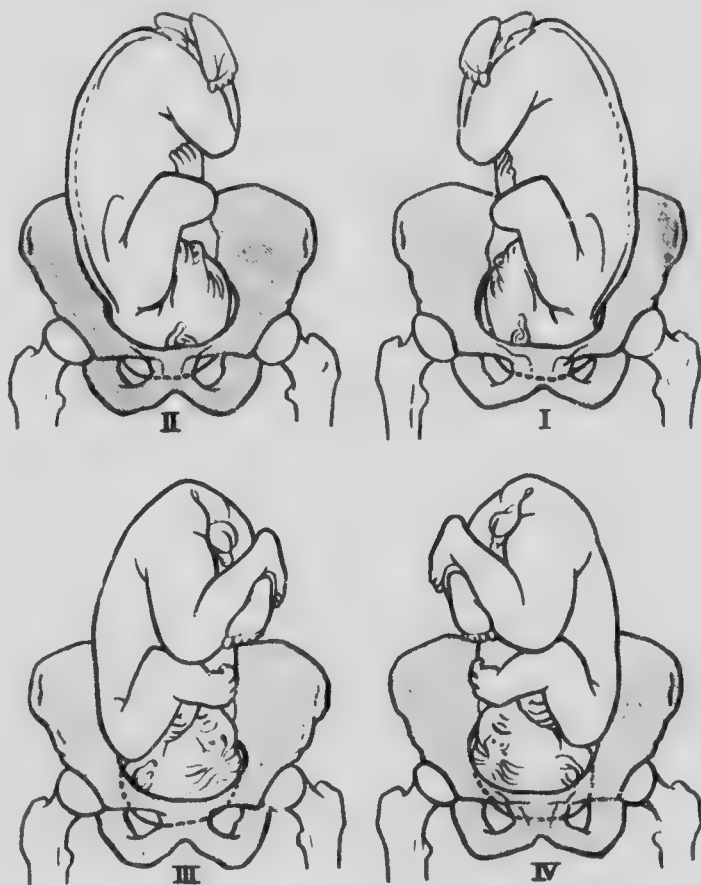


FIG. 53.—The four positions in which the foetus may lie in vertex presentation.

2nd position—back to the right and in front.

3rd position—back to the right and behind.

4th position—back to the left and behind.

The first position is very much the most common,

and the next most frequent is the third position. The second and fourth positions rarely occur (*v.* page 46).

Diagnosis.—**Abdominal Palpation.**—The diagnosis of vertex presentation is best made by this means. The head is found in the lower uterine segment, and either just above the pelvic brim or engaged in it. The



Fig. 54.—Vertex presentation. The foetus as felt by abdominal palpation.

chin lies at a higher level in the uterus than the occiput, thus showing that the vertex presents, and not the brow or face (*v.* Fig. 54). The breech is at the fundus, and between it and the head lies the body usually inclined to one or other side. The limbs may or may not be felt, according as the back is posterior or anterior.

The position of the fœtus is ascertained by noting whether the back is turned to the left or to the right, and anteriorly or posteriorly (*v.* Fig. 53.).

Vaginal Examination.—A hard rounded tumour is found to be presenting, and upon it the sutures and fontanelles are felt (*v.* Fig. 55). The anterior fontanelle is recognised by its lozenge-like shape; the posterior is smaller and triangular. If, however, the bones overlap one another, owing to moulding, the fontanelles may be obliterated. Their site can then be recognised by the fact that a number of sutures meet at a point. At the anterior fontanelle four sutures meet; at the posterior, three.

The position of the fœtus is ascertained by noting the situation of the fontanelles and sutures relatively to one another and to the pelvis. Thus, in a first position, the posterior fontanelle lies to the left of the anterior fontanelle and in relation to the anterior wall of the pelvis. In the second position, the posterior fontanelle lies to the right of the anterior fontanelle and in relation to the anterior wall of the pelvis. The third position is the reverse of the first position, and the fourth of the second (*v.* Fig. 55).

Auscultation.—The point of maximum intensity of the fœtal heart is found below the umbilicus, and to one or other side of the middle line according to the side at which the back lies.

Mechanism.—The movements by which the fœtus is adapted to the varying diameters of the genital canal can be resolved into five distinct groups:—

- (1) Descent; and coincidently,
- (2) Flexion.
- (3) Internal rotation.
- (4) Extension.
- (5) External rotation.

1) **Descent.**—As the uterus contracts, the presenting head, if it is not already fixed, is driven down into the

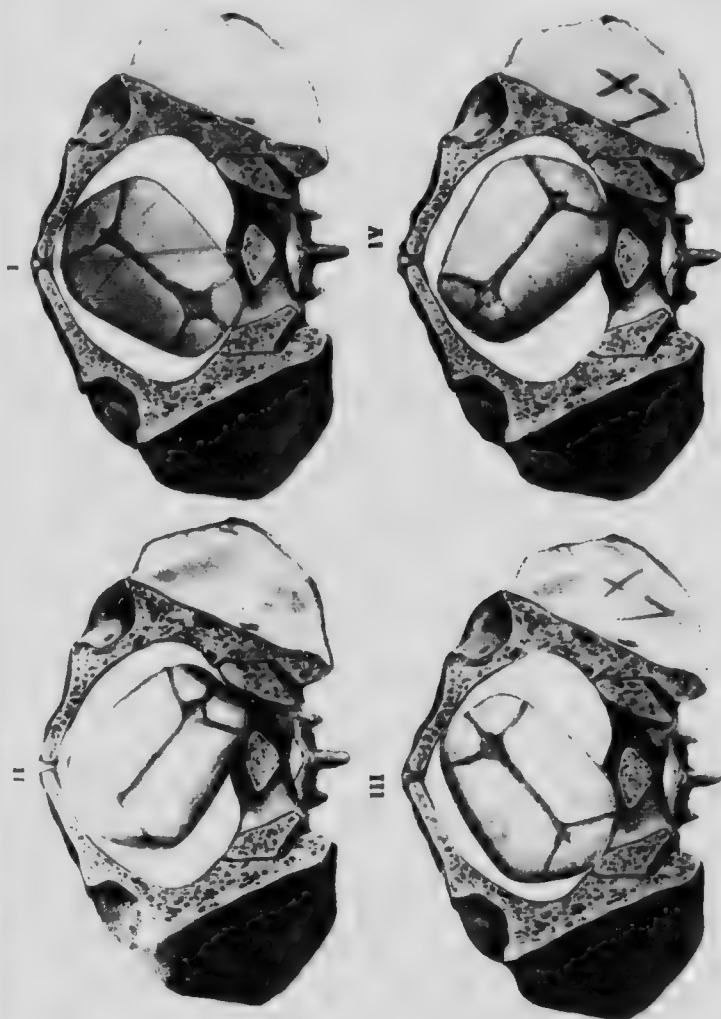


FIG. 55.—The four positions of the fetal head in vertex presentation, as felt from below.

brim of the pelvis under the influences of the forces to which we have already referred (cf. page 131). It enters the brim in such a manner that its bi-parietal diameter is parallel to one or other of the oblique

diameters of the pelvis, according to the position in which the child lies. As a rule both parietal bones pass through the brim simultaneously, and the sagittal suture bisects the true conjugate. This is known as the *synclitic* engagement of the head (*v.* Fig. 65). As will be seen presently, under certain circumstances the parietal bone which is nearer the symphysis may pass through the brim before its fellow (*v.* Fig. 66); or, on the other hand, the parietal bone which is nearer the promontory may be in advance (*v.* Fig. 67). In such cases the mode of engagement is said to be *asynclitic* (*v.* page 157). In describing the mechanism of labour here, we shall suppose that the fœtus lies in the first position. In that position, the head enters the brim with its biparietal diameter parallel to the left oblique diameter of the brim, and in a position of partial flexion in consequence of the normal intra-uterine attitude of the fœtus.

2 **Flexion.**—The second act in the mechanism of labour is the completion of flexion of the head (*v.* Figs. 56, 59). The engaging diameter at the beginning of labour is one between the sub-occipito-bregmatic and the occipito-frontal diameters, and the vertex is the presenting part. As the head passes through the brim the degree of flexion present increases. Two results follow from this—the sub-occipito-bregmatic diameter becomes the engaging diameter, and the posterior fontanelle becomes the presenting point (*v.* Fig. 57). The cause of flexion depends upon the nature of the force which is acting upon the fœtus. We have seen that two forces may act upon the fœtus:—one, the general contents' pressure acting equally over the base of the skull; the other, the fœtal axis pressure acting along the axis of the fœtus, and transmitted to the head, at first through the vertebral column.

Flexion resulting from the general contents' pressure

alone is due to the shape of the head. As we have mentioned, this pressure acts as a uniform force over the base of the skull, and so, if the resistance to the descent of the head was equal on all sides, would cause a simultaneous descent of all parts of the head. Owing to the pre-existing partial flexion of the head, the occiput where it meets with the resistance of the brim is



FIG. 56.—Vertex presentation. First position. Head descending through the pelvic brim; flexion just beginning.

comparatively sheer, and consequently slips readily past the brim. The sinciput, on the other hand, is more prominent and tends even to project slightly beyond the margin of the brim, and, in consequence, there is more or less resistance to its descent according as the head is large or small in comparison with the pelvis. In normal cases, where the antero-posterior engaging diameter has almost sufficient room to pass easily

through the oblique diameter, the pre-existing degree of flexion is but slightly increased. When, however, the oblique diameter of the brim is narrowed, and when, consequently, considerable obstruction is offered to the engaging diameter of the head, flexion is exaggerated, and, in such cases, may proceed so far that the occipital bone constitutes the presenting part. This excessive



FIG. 57.—Vertex presentation. The foetal head as felt from below. Flexion is still incomplete. The arrow shows the direction in which internal rotation takes place.

flexion of the head is known as Rœderer's obliquity (*v.* page 218).

The manner in which foetal axis pressure causes flexion is simple. The first effect of the uterine contractions, after the liquor amnii has in great part escaped, is to straighten out the previously curved foetal body. Then, the force of the contraction is transmitted to the breech, and constitutes a force acting downwards through the axis of the foetal body. This force is at first transmitted to the head through the occipital condyles,

and consequently acts on the base of the skull at a point nearer the occiput than the sinciput. Accordingly, the occiput is driven down until the chin comes into contact with the chest. This process will be readily understood by reference to the accompanying diagram (*v.* Fig. 58). The fetal axis pressure acting along a line DE acts on the engaging plane AB of the head at a point nearer the occiput than the sinciput. Con-

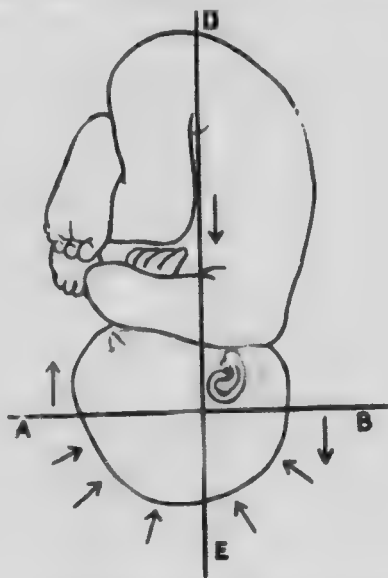


FIG. 58.—Diagram showing how flexion is produced.

sequently, the occipital end of the plane will be driven down more rapidly than the anterior end.

(3) **Internal Rotation.**—When flexion has occurred, the head is advancing with the posterior fontanelle lying lowest and the sub-occipito-bregmatic diameter lying in the right oblique diameter of the pelvis (*v.* Fig. 59). The head continues in this position until the presenting part reaches the pelvic floor, when the occurrence of internal rotation brings the sub-occipito-bregmatic dia-

meter to lie in the antero-posterior diameter of the outlet (*v.* Fig. 60).

The causes of internal rotation are the shape of the fetal head, and the alteration which takes place from above downwards in the length of the diameters of the pelvis. At the pelvic brim, the oblique and transverse diameters are greater than the conjugate; but, at the



FIG. 59.—Vertex presentation. Head advancing through lower part of pelvic cavity. Flexion complete. Internal rotation just beginning.

outlet, the antero-posterior diameter is the greater. Consequently, as there is a natural tendency for the large engaging diameters of the head to adapt themselves to the large diameters of the pelvis, the head rotates as it descends in such a manner as to bring those diameters which were in the oblique diameter of the pelvis into the antero-posterior diameter. The shape of the pelvis and the resistance offered by the perinæum

and vaginal walls are also important factors in the production of internal rotation. The inner surface of the ischium resembles a portion of a helix of such a curve that if a rounded body, such as the foetal head, is driven downwards through the pelvis with sufficient force, and if, at the same time, it is kept in close apposition with this inner surface or anterior inclined plane of the ischium, it will be gently guided forwards until its lowest portion comes to lie in the pubic arch. This tendency to forward rotation is increased by the fact that there is less resistance to the advance of the presenting part under the pubic arch than elsewhere, since the resistance of the vaginal walls and perinæum obstructs its descent posteriorly. It is thus seen that the movement of internal rotation is, in fact, identical with the turning of a screw in its socket, the foetal head forming the screw, the pelvic canal the socket. The length of the turn depends upon the position of the lowest portion of the presenting part—*i. e.* in the case of a vertex presentation the region round the posterior fontanelle. If the foetus lies with its back anteriorly—that is, with the occiput at the anterior extremity of either oblique diameter—then internal rotation takes place through one-eighth of a circle. If, on the other hand, the occiput is in relation to the posterior end of the oblique diameter, internal rotation takes place through three-eighths of a circle. It may be considered to be a definite law governing internal rotation that whatever part of the presentation is lowest will rotate to the front. In a vertex presentation under normal circumstances, the occipital end of the head is the lowest, and consequently it rotates forwards. If, as sometimes happens, the sinciput lies lowest, then internal rotation takes place in the opposite direction, and the forehead is rotated forwards.

(4) **Extension.**—When internal rotation is complete the head is lying so that its sub-occipito-bregmatic diameter corresponds approximately to the antero-posterior diameter of the outlet, and the occipital bone is under the pubic arch. Now the advancing head has to travel in a different direction from that in which it started, in order to suit itself to the forward curve of

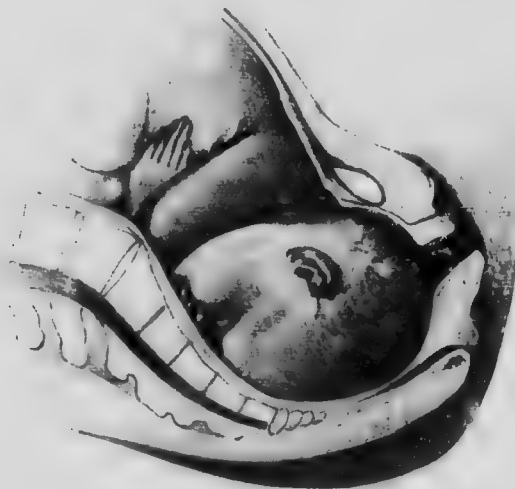


FIG. 60.—Vertex presentation. Head at outlet, internal rotation complete, extension just beginning.

the pelvic canal (v. Fig. 62). During the movements of internal rotation the head has been adapting itself to this curve, and now it advances along it, and at the same time is delivered, by a movement of extension. In this stage, the occiput of the child becomes fixed beneath the pubic arch, and the head, as it extends, rotates round this fixed point, in such a manner that the chin leaves the chest, and the face slowly appears from above the perinaeum.

The cause of extension is very simple. The forces which act on the head of the foetus are the driving force of the uterus and the resistance of the perinæum and of the muscles of the pelvic floor, and their resultant is a force acting along a line which is directed forwards and slightly downwards. In order that the head may move in this direction extension must take place. The active contractions of the levator ani muscle supplement the passive resistance of the other structures of the pelvic



FIG. 61.—The pelvis as seen from above showing the levator ani muscle. (Norris.)

floor, and assist in driving the head forwards. When the muscle is in an uncontracted condition it forms the concave sides of a kind of gutter or groove, in which, during a part of the stage of expulsion, the foetal head lies. When the muscle contracts, this groove becomes shallower, and so pushes forward anything which may be lying in it.

5) **External Rotation.**—This, the final movement of the head, consists of two parts—(a) restitution, (b) external rotation. During internal rotation, the head becomes slightly twisted as regards the shoulders, and

this position continues so long as the head is subjected to the pressure of the pelvis. As soon as the head is freed from this pressure, its first movement is to rotate, so as to resume its normal relation to the shoulders, *i. e.* restitution occurs. As the head travelled through the pelvis, the shoulders became



FIG. 62.—Vertex presentation. Head appearing through vulva, extension continuing.

engaged in the brim in the oblique diameter at right angles to that in which the antero-posterior diameters of the head engaged. Thus, in a first position, the shoulders engage in the left oblique diameter of the pelvis. As they descend, the anterior shoulder, being slightly lower than the posterior one, rotates in front, and the shoulders lie in the antero-posterior diameter of the pelvis. It is this movement that causes the completion of external rotation, the already delivered

head rotating to suit the new position of the shoulders (cf. Fig. 63). Usually, the head rotates in such a manner as to return to its former position; *i. e.* in a first position, it rotates with the occiput pointing to the mother's left thigh, in a second position, with the occiput pointing towards the right thigh.



63.—Vertex presentation. Internal rotation of shoulders and external rotation of head are complete.

When the anterior shoulder has rotated in front, it becomes fixed under the pubic arch. The posterior shoulder then sweeps over the perinæum, and is born. The trunk follows, with the arms folded upon the chest. The hips undergo a similar rotation to the shoulders, and are born with their bi-trochanteric diameter in the antero-posterior diameter of the outlet. Finally, the lower limbs appear.

It is interesting to note that the different movements in the mechanism of labour are, so to speak, complementary to one another. Thus, first occurs flexion of the head; then, internal rotation; then, extension, the complement of flexion; then, external rotation, the complement of internal rotation.

In the second position the head engages with its



FIG. 64.—Occipito-posterior position of vertex.

bi-parietal diameter in the right oblique diameter of the pelvis. Flexion, internal rotation, and extension occur as before. The shoulders engage in the right oblique diameter of the pelvis, and, as a consequence of the anterior rotation of the left shoulder, the occiput turns towards the mother's right thigh.

In the third position the mechanism of delivery is similar to that of the second position, except that the head enters the brim with its bi-parietal diameter in

the left oblique diameter of the pelvis, and that, during internal rotation, the head rotates through three-eighths of a circle instead of through one-eighth. This is due to the fact that the occiput has to travel to the front from the posterior end of the right oblique diameter, instead of from the anterior end of the left oblique diameter.

In the fourth position the only differences from the first position consist in the head entering the brim with its bi-parietal diameter in the right oblique diameter of the pelvis, and in internal rotation taking place through three-eighths of a circle instead of through one-eighth.

Abnormal mechanism.—**Persistent Occipito-posterior Position.**—In some cases of vertex presentation, the forehead, and not the occiput, rotates to the front. This movement is due to incomplete flexion of the head, which causes the forehead to lie at a lower level than the occiput. Accordingly, following the rule that the part of the child which first impinges on the pelvic floor rotates in front, forward rotation of the forehead occurs (*v.* Fig. 64). Then, the latter is fixed below the pubes, and the head is usually born by a slight movement of flexion instead of extension. As a result of this, labour is very much more tedious than is usual, and during the birth of the head the perinaeum is over-distended and frequently lacerated.

Asynclitic Engagement.—Instead of the head entering the brim with the two parietal bones on the same level, one parietal bone may lie lower than its fellow. If the head is deflected towards the promontory, so that the anterior parietal bone lies lowest, we speak of anterior asynclitism (*v.* Fig. 66); if it is deflected towards the symphysis, so that the posterior parietal bone lies lowest, of posterior asynclitism (*v.* Fig. 67). These conditions will be discussed separately.

Anterior Asynclitism. -- Anterior asynclitism, anterior parietal presentation, and Naegele's obliquity, are the terms applied to the presentation when the head is inclined toward one or other shoulder in such a manner that the sagittal suture approaches the promontory of the sacrum, and the anterior parietal bone lies lowest.

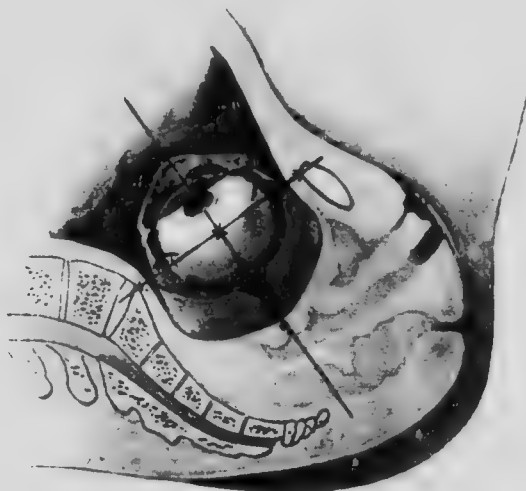


FIG. 65.—Synclitic engagement of head.

Anterior asynclitism is the rule in a flat pelvis, and also in a generally contracted and flat pelvis. It is brought about by the obstruction offered to the descent of the posterior parietal bone by the projecting promontory of the sacrum. The greater the degree of flattening of the pelvis the greater this obstruction, and the nearer the sagittal suture approaches the promontory. Consequently, it is said that the distance between the sagittal suture and the promontory affords an indication of the degree of contraction

of the pelvis (Litzman). If the contraction is very great, the head becomes so much inclined that the sagittal suture may rise above the promontory, and the ear present.

Anterior asynclitism also occurs if the abdomen is very pendulous, as the oblique position of the fetus brings the anterior parietal bone lowest.



FIG. 66.—Anterior asynclitism of head. Anterior parietal bone presenting.

As the head descends, the posterior parietal bone is arrested by the promontory ; the result is that the head rotates on its antero-posterior axis, so that the anterior parietal bone descends and the sagittal suture approaches the promontory. At the same time the anterior fontanelle descends, and the eminence on the anterior parietal bone passes the brim. If the obstruction is not too great, the anterior parietal bone becomes fixed behind the symphysis, and, the head rotating round

this fixed point in the opposite direction to its former rotation, the posterior parietal bone squeezes itself past the promontory, and so the large diameters of the head come through the brim.

Posterior Asynclitism.—Posterior asynclitism, posterior parietal presentation, and reversed Naegele's obliquity, are the terms applied to the presentation

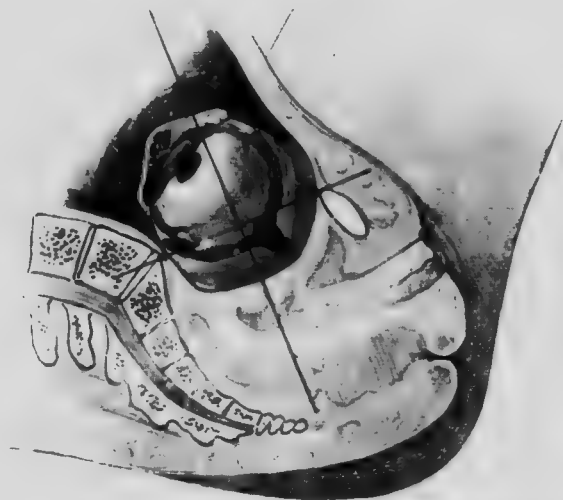


FIG. 67.—Posterior asynclitism of head. Posterior parietal bone presenting.

when the head lies in such a position that the sagittal suture approaches the symphysis pubis and the posterior parietal bone lies lowest.

The exact cause of posterior parietal presentation is unknown, but, presumably, increased obstruction offered to the descent of the anterior parietal bone by the symphysis has something to do with its occurrence. This presentation is met with both in contracted and normal pelvis. In the normal pelvis the presentation

probably occurs when the axis of the pregnant uterus lies behind the line of the axis of the pelvic brim (Herman). In such a case, the anterior parietal bone would be driven more against the symphysis than is usual, and its descent thereby retarded. Posterior asynclitism may also occur as a consequence of latero-flexion of the fœtus, in which the head is displaced

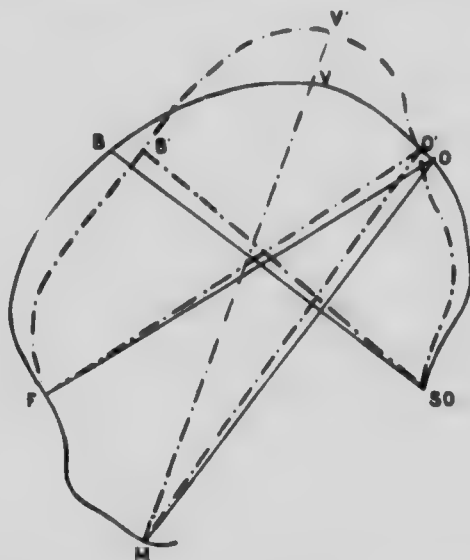


Fig. 68. —Vertex presentation. The moulding of the fetal head. The dotted outline shows the shape of the moulded head, the firm outline of the unmoulded head. (*Budin.*)

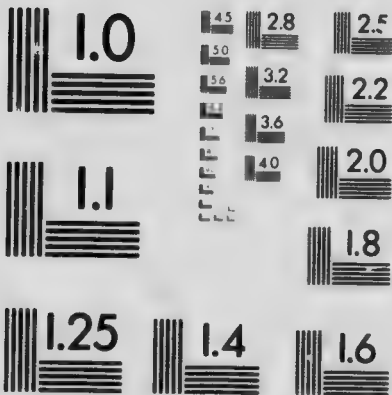
forwards over the symphysis. Such a latero-flexion may be the result of a tumour on the posterior wall of the uterus, or of a hand prolapsed below the head (*v.* Fig. 161).

In the rare cases in which the head comes through the brim in this presentation, the following mechanism is said to occur:—"The pains drive down the anterior parietal bone, and, as it descends, the posterior lying



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parietal bone moves up, and then, first the anterior parietal eminence passes the brim, then the posterior. Sometimes the side of the head opposite the promontory remains fixed, and the head rotates round this point as, in anterior parietal presentation, it rotates round the symphysis. But this only happens when the foetal head is small and soft, so that it becomes indented instead of moving up." (Herman.)

Moulding.—In vertex presentations the occipito-

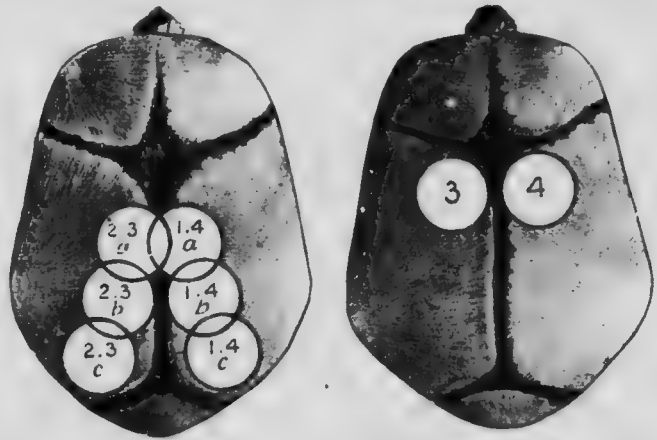


FIG. 69.—Diagram showing position of centre of caput succedaneum in the several positions of the vertex. 1.4a, 1.4b, 1.4c, successive positions of centre of caput succedaneum in the first position of the vertex, and in the fourth position in which forward rotation has occurred. 2.3a, 2.3b, 2.3c, successive positions of centre of caput succedaneum in the second position of the vertex, and in the third position in which forward rotation has occurred. 3, position of centre of caput succedaneum in third position in which forward rotation has not occurred. 4, position of centre of caput succedaneum in fourth position in which forward rotation has not occurred.

frontal, sub-occipito-bregmatic, and bi-parietal diameters of the foetal skull are diminished ; while the supra-occipito-mental diameter is increased. The effects these changes produce on the shape of the head are shown in the figure (*v.* Fig. 68).

The caput succedaneum forms at first near the coronal suture and over the right or left parietal bone according as the foetus lies in the first or second position. As the head descends, the caput succedaneum moves backwards along the sagittal suture until it lies close to or slightly over the posterior fontanelle (*v.* Fig. 69).

CHAPTER IX.

THE MANAGEMENT OF NORMAL LABOUR.

Definition of Normal Labour—Preparations for—Obstetrical Couch—Obstetrical Armamentarium—Management of Normal Labour, First Stage, Second Stage—Methods of preserving the Perinæum—Care of the Cord after the Birth of the Head—Management of the Third Stage—Ligation of the Cord—Expulsion of the Placenta—"The Dublin Method"—Method of determining whether the Placenta is in the Uterus or in the Vagina—Ergot—Anæsthesia.

Definition.—Normal labour consists in the child presenting by its vertex, in the uterine contractions coming on, and following one another in such a manner, that the child is born and labour is ended without artificial aid or any complications within twenty-four hours. This happens in about ninety per cent. of all labours, and therefore it is very important to study the phenomena and management of normal labour, as it is in the management of normal labour that by far the greater number of mistakes are made.

Preparation for labour.—During the last fortnight of pregnancy, the patient should pay particular attention to certain points. She should have a warm bath daily, and her bowels should be so regulated as to avoid the constipation which is especially prone to occur towards the end of pregnancy. As soon as the premonitory

symptoms of labour are noticed, a purgative must be administered—castor oil (one to two ounces), sulphate of magnesia (half an ounce), or liquid extract of cascara sagrada (one to two drachms), followed after a few hours by an enema. Another enema must be given soon after labour has begun.

It is always necessary to instruct a primipara as to what she requires to have in readiness for her delivery. The following list will be found fairly complete :—two mackintoshes, one large enough to protect the mattress completely, the other about one-third that size ; four binders $1\frac{1}{4}$ yards long, and 18 inches wide ; half a dozen packets of sanitary towels ; half an ounce of surgical pins ; one skein of glazed linen thread ; and one pound of absorbent gamgee tissue, to use as sponges. Various materials are used for making binders—stout calico or linen, a material known as crashe, or ordinary roller towelling. Whatever material is chosen the binders should be washed prior to use, in order to make them softer and more pliable. The linen thread is used for tying the cord. It should be cut into lengths of twelve inches, doubled, and the ends knotted together. It must be boiled or soaked in corrosive sublimate lotion for a few hours prior to use, to sterilise it.

The following articles must be provided for the infant :—A square of flannel or an old blanket for receiving the child at birth ; several pieces of soft old linen for wiping the eyes, mouth, etc., and antiseptic wool for dressing the cord ; a little vaseline or lanoline ; an ounce of dusting powder (equal parts of boracic acid and starch) ; a piece of pure "infant's soap" ; a small Turkish sponge. The last must not be used for the infant until the vernix caseosa has been removed, and for the first washing it is preferable to use a piece of cotton-wool or old linen, which can be burnt afterwards.

A suitable supply of clothing for the infant must also be provided, but it is unnecessary to enter into a description of this.

It is also of importance to know how the obstetrical couch is made. In making it, we must combine comfort with cleanliness and convenience. A firm and well-made hair mattress meets every requirement; but it should, if possible, have boards beneath it instead of springs. The bedstead should be about two feet in height. The bed is made in the following manner, from below upwards:—(1) the mattress; (2) the large mackintosh; (3) an under blanket; (4) a sheet and bolster; (5) the small mackintosh enclosed in the draw-sheet; (6) a pillow; (7) a top sheet and the requisite number of blankets. There should be a piece of oil-cloth or mackintosh hanging as a valence to protect the side of the bed.

The other essentials in the room are,—a fire, unless the weather is extremely warm, and it should, if possible, be one on which a kettle can be boiled; a large jug thoroughly scoured inside and outside, to hold about one and a half gallons; a stand of some kind on which it can be placed, and which will raise it about two feet above the patient's bed; two additional jugs, one for cold and one for hot water; three or preferably four basins; an abundant supply of boiling and of cold water; a feeding cup; a small bath; a piece of oil-cloth to protect the floor.

The obstetrical armamentarium.—And now of what must the doctor's armament consist? We shall first mention the things necessary for the normal case, and then give a list of everything that will be required for any operation short of abdominal section. For a normal case he requires:—

- (1) Corrosive sublimate tablets.

- (2) Cyllin or lysol.
- (3) Soap.
- (4) Two pairs of rubber gloves.
- (5) A good nail brush.
- (6) A metal catheter (*v.* Fig. 70).
- (7) Higginson's syringe for administering enemata.
- (8) A pair of strong scissors.
- (9) Some preparation of ergot.

Any mention of a douche for douching the vagina or uterus is intentionally omitted in this list, as, in normal labour, douching of any kind is unnecessary.

In order to be prepared for almost all obstetrical



FIG. 70.—Female metal catheter.

emergencies except pubiotomy and abdominal section, the following in addition are required :—

(1) A syphon douche and glass nozzle. The best kind consists of a plain rubber tube, about six feet in length, without valves of any kind, but with a ball expansion for filling it. At one end it has got a sinker which keeps it immersed in the fluid used ; a little further up, the tube is encased in a movable horseshoe-shaped guard of vulcanite, which fits over the edge of the jug and prevents kinking (*v.* Fig. 71).

- (2) A needle-holder, and some large and small curved needles (*v.* Figs. 172, 173).
- (3) An axis-traction forceps (*v.* Fig. 193).
- (4) A male catheter, No. 3, for removing mucus from the child's larynx.

- (5) Two Bozemann's uterine catheters, one large and one small (*v.* Fig. 72).
- (6) A perforator—Naegele's or Simpson's (*v.* Fig. 195).
- (7) Braun's hook for decapitation (*v.* Fig. 200).
- (8) A cranioclast—Braun's, or Winter's modification of Auvard's (*v.* Fig. 196).
- (9) Frommer's modification of Bossi's dilator.
- (10) A long and narrow forceps for plugging the uterus (*v.* Fig. 166).



FIG. 71.—Syphon douche, as described in the text.

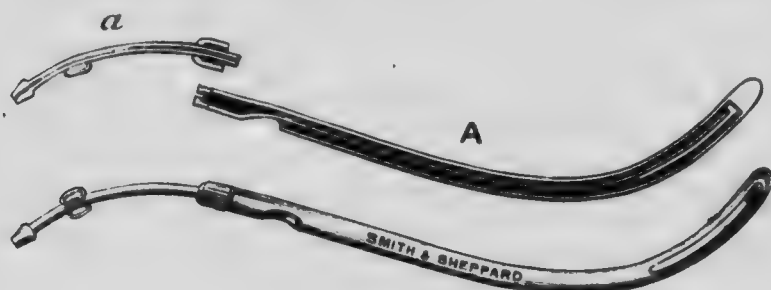
- (11) Two American forceps (*v.* Fig. 73).
- (12) A posterior speculum (*v.* Fig. 74).
- (13) Two or three curettes, including Rheinstädter's (*v.* Fig. 132).
- (14) A pair of long-handled and strong scissors (*v.* Fig. 201).
- (15) Aseptic silk and catgut.
- (16) Chloroform and inhaler.
- (17) Iodoform gauze for plugging.
- (18) A box of absorbent cotton-wool for the same purpose.

(19) Two gum-elastic catheters, Nos. 10—12, to act as repositors in the case of a prolapsed cord.

(20) A hypodermic syringe.

(21) The following drugs are required :—Tincture of opium for administration by the mouth or in an enema, and ether, sulphate of strychnine, and morphia, for hypodermic injection.

In addition to these instruments it is very advisable to carry a suitably devised steriliser, in which the necessary instruments can be boiled. The pattern we recommend is shown in Fig. 77. It is a steriliser



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FIG. 72.—Bismann's return catheter, as modified by Gibson.

which we have modified slightly from one originally suggested by Salisbury-Sharpe. If this apparatus is placed horizontally it forms a steriliser, which can be placed on an ordinary fire or gas-stove. The tray which it contains can be removed when sterilisation is complete, and be used as an instrument tray. When the apparatus is placed vertically it forms a douche-can, to the bottom of which a rubber tube can be attached (*v.* Fig. 78). A portable douche-stand has been devised by Pasley, which can be fitted to the rail of the bedstead and from which the can may be hung (*v.* Fig. 79).

Such a steriliser cannot be carried in an ordinary

midwifery bag, as its shape is not suitable. A bag, however, in spite of its popularity, is not a convenient means of carrying obstetrical instruments, as it does not hold as much as does a properly devised case of the

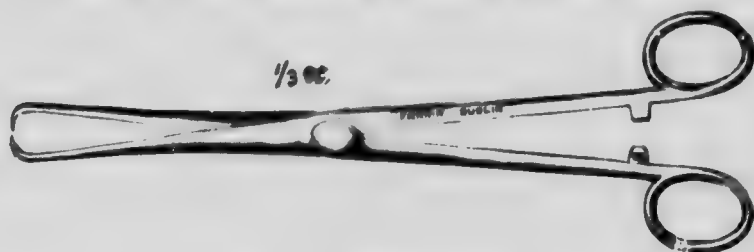


FIG. 73. American forceps.

same size. We use a case similar to that shown in Figs. 75, 76. Along one side of the bottom of this case is a space for the steriliser, and along the other side are spaces for bottles which contain drugs and ligatures. The upper part of the case contains a tray in which all instruments are kept. Gloves, mackintosh apron or sterilised coat in a cover, and the portable douche-stand can be placed inside the steriliser. The



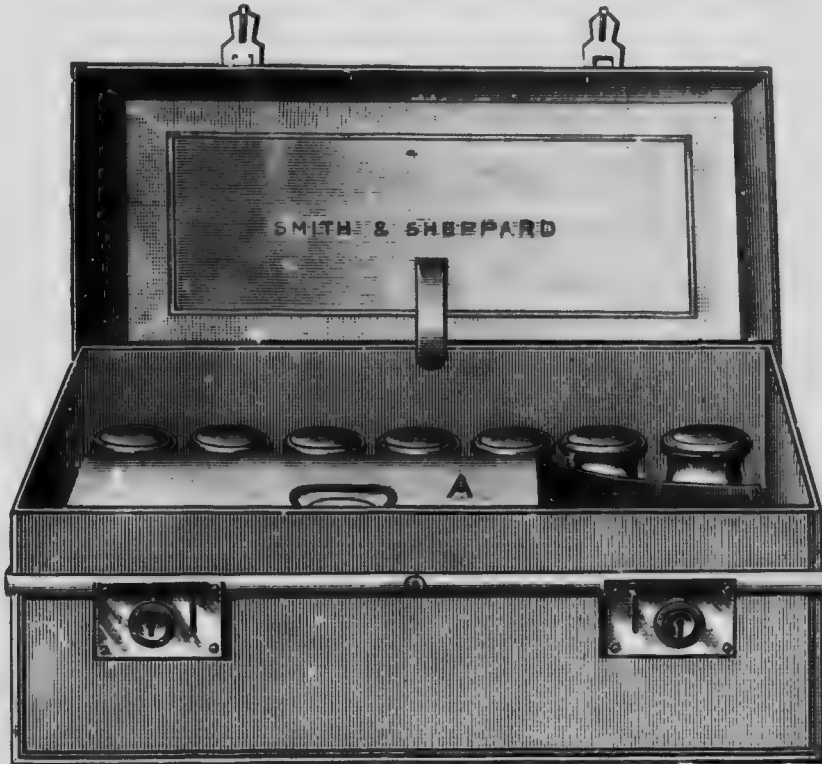
FIG. 74.—Posterior speculum.

latter also provides a convenient place in which to bring home dirty instruments, &c., after use.

Management.—The management of the three stages of labour must be considered separately.

First Stage.—The first stage begins with the onset of labour pains, and ends with the full dilatation of the

os and the rupture of the membranes. Its chief physiological phenomenon is the occurrence of intermittent contractions of the uterus, which tend to drive the ovum into, and so to dilate, the cervical canal. Its manage-



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FIG. 75.—The author's midwifery case. A. The steriliser. The tray has been removed.

ment consists in maintaining the patient's strength, in helping nature in a natural way, and in avoiding meddling and dangerous interference.

Concerning the first of these it is unnecessary to say much. The patient must get easily digested food at short intervals, and anything likely to derange the

stomach must be avoided. At the beginning of labour, when the contractions are few and far between, she should have some occupation which will keep her mind off her condition, and so prevent fretting. If the first stage is long, and the patient has not had sleep recently, a hypodermic injection of a quarter or a third of a grain of morphine is valuable. It sometimes gives sleep and



FIG. 76.—The author's midwifery case seen in section, showing the positions of, A, the tray; B, the steriliser; and C, the perforated instrument tray.

in all cases reduces considerably the intensity of the pain, and so helps to bridge the interval between the beginning of acute suffering and the stage at which obstetrical anæsthesia can be started.

The second indication—to help nature in a natural way—is easily carried out. We can help nature to dilate the cervix, by keeping the woman in such a position that the action of gravity aids the contractions in

driving the ovum downwards against the os ; in other words, by allowing the patient to walk about or sit in a chair, and not compelling her to remain in bed. Indeed, instinct will prompt her to maintain an upright posture. Moreover, the uterus must be in such a position that its contractions can act to the greatest advantage. If the abdomen is pendulous, or if any degree of lateral obliquity of the uterus is present, the contraction will drive the head, not into the pelvic cavity, but against the brim. Such obliquity, or anteversion, of the uterus is best corrected by applying tightly an

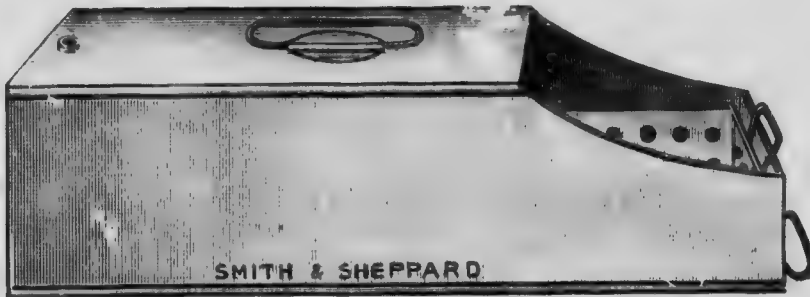


FIG. 77.—Sharpe's steriliser, as modified by the author.

abdominal belt or binder, so as to keep the uterus in a proper position ; also by making the patient lie on the side to which the head is deflected, or upon her back in case of marked anteversion. Another important point is to remove all obstruction to the descent of the head. In a normal case the only obstructions that may be present are a full bladder or a loaded rectum. To avoid the former, the patient must be made to pass water frequently, or, if necessary, a catheter must be passed. To insure that the rectum is empty during the second stage a purgative should be given as soon as the premonitory symptoms of labour appear,

followed in a few hours by a soap-and-water enema. It is well to repeat the latter as soon as the labour

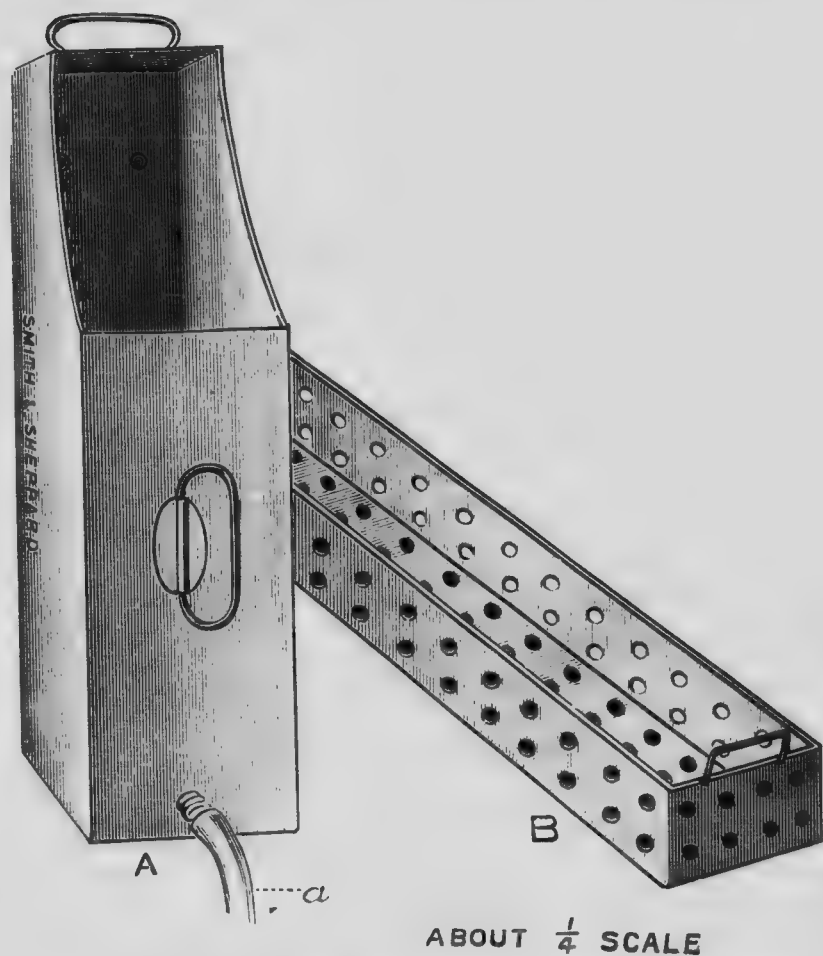


FIG. 78.—Sharpe's steriliser, ready for use as a douche can. A, Douche can. a, Rubber tube. B, Perforated instrument tray.

passes into the second stage, to avoid the soiling caused by faeces being forced out by the descending head. It is useless to make the patient "bear down," *i.e.*

voluntarily contract her abdominal muscles, during the first stage. As soon as voluntary efforts have any effect, that is, as soon as the os is dilated, she will "bear down" of her own accord. Premature efforts only waste her strength, and make but slight impression upon the cervix, inasmuch as they tend to drive

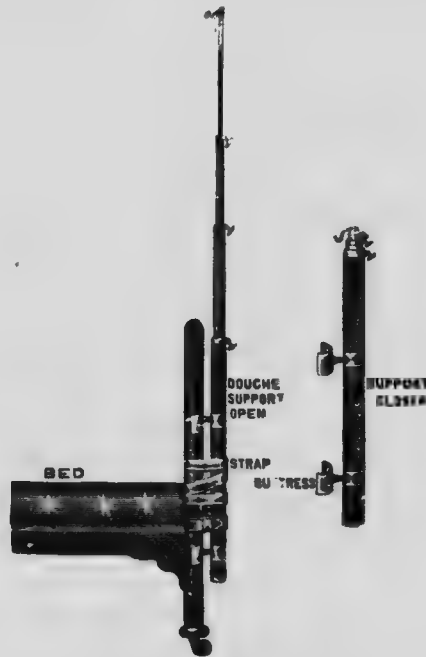


FIG. 79.—Pasley's portable douche stand.

the entire uterus and its contents into the pelvis, and not to force the ovum against the cervix. Indeed, by the absence or presence of voluntary bearing-down efforts, we can usually tell whether the patient is in the first or second stage, without making a vaginal examination.

The third indication is to avoid meddlesome and dangerous interference. This includes unnecessary vaginal examinations; manual or instrumental dilata-

tion of the os ; the application of the forceps, which at this stage is not only unnecessary, but contra-indicated ; and prophylactic vaginal douching, when it is not required (*v.* page 5). The advantages of abdominal palpation over vaginal examination and the dangers of the latter have been already mentioned. One vaginal examination, however, is necessary, in order to determine if the cord is presenting or prolapsed. It should be made, if possible, just after the membranes have ruptured. When the head has been fixed for some time before labour, even this examination is unnecessary.

Second Stage.—The second stage begins with the full dilatation of the os, and ends with the birth of the child. Its chief physiological phenomena are the continuance of involuntary and intermittent uterine contractions with the added help of the voluntary contractions of the abdominal muscles, the diaphragm and, indeed, of most of the muscles of the body. The results of these contractions are:—first, that the membranes rupture, having lost the support of the cervix ; and secondly, that the foetus advances downwards through the vagina, presses on and distends the perinæum, and finally is born. The indications for the management of the case are the same as before, until the head appears at the vulva. As, however, the phenomena have changed, so the manner of carrying out the indications changes also ; and we try to help nature in a different way from the method adopted in the first stage. As the os is fully dilated, and as voluntary “bearing-down” efforts are now occurring, we must put the patient in such a position that she can make the best use of her strength. This she can do in bed. Let the patient lie on her side, with her feet against the end of the bed, and give her something on which

she can pull. A towel tied to the foot of the bed is best, as, by pulling on it, she can counterbalance the force with which she is straining against the end of the bed. At the same time encourage her to hold her breath during a pain, and to "bear down" with all her strength.

As soon as the head appears at the vulva, the treatment becomes more active; and the obstetrician prepares for the immediate delivery of the patient. The chief indications are to obtain the slow delivery of the head, and to ensure that the smallest possible diameter distends the perinæum. There are two positions in which the patient may be placed; she may lie either upon her left side or upon her back. If she lies on her back she must also be placed in the cross-bed position, and in normal cases this is unnecessary. Having the patient, then, in the side position, what method shall we adopt to prevent laceration of the perinæum? Two methods have been proposed,—the direct and the indirect. The direct method consists in directly supporting the perinæum with the hand, with the object of preventing it from becoming over-distended, and lacerated. It consists in laying the palm of the hand on the perinæum, with the concavity between the first finger and thumb directed so as to enclose the posterior end of the vulva, and so preventing the perinæum from being forced downwards by the advancing head, and at the same time directing the pressure so as to push the head forwards beneath the pubic arch. The indirect method consists in trying to push the head forward without any attempt being made to support the perinæum. This can be done either by introducing two fingers into the rectum, or, better still, by applying the "heel" of the hand behind the anus, and pushing the head forward.

We shall describe the latter method in full, as it is perhaps the best of all methods for the preservation of the perinæum. To understand it clearly, it will be a help to study the accompanying diagram (*v.* Fig. 80).

The rod A B represents the foetal body which is being driven downwards by the uterine contractions in the direction shown by the arrow C. This direction causes the head to press upon the perinæum H. If the end A of the rod can be pushed forwards towards A', then the uterine contractions will drive the rod in

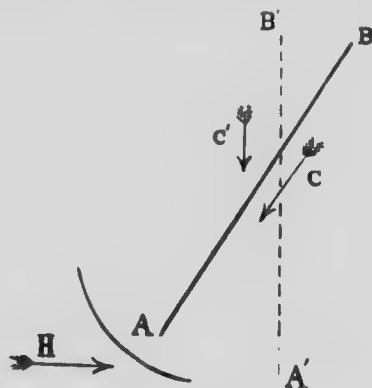


FIG. 80.

the direction shown by the arrow C', that is through the vulva. Accordingly any pressure applied in the direction of the arrow H will take a proportionate amount of pressure off the perinæum.

One point must be remembered:—the parturient canal is in the shape of a curve, with the concavity forwards. This curve may be considered as consisting of an upper segment and a lower segment. While the foetus is advancing in the upper segment of the curve, it is being driven in the direction of a point midway between the anus and the tip of the coccyx. As it comes into the lower segment, it changes its direction,

and moves towards the vulva. If forward pressure is applied to the advancing head, while it is still in the upper segment of the curve, such pressure will drive it back into the uterus. If, however, we wait until the head gets into the lower segment, then forward pressure will push the head off the perinæum and in the direction



FIG. 81.—The head in the act of being born. The heel of the right hand, applied between the anus and the tip of the coccyx, presses the head forwards, whilst the fingers of the left hand endeavour to draw it forwards. The perinæum itself is not pressed on in any way.

of the vulva. Accordingly, this pressure can only be of use when the head has passed the "sticking point," if we may call it so,—that is the point of junction of the two portions of the parturient curve. This is the theory of the method, which is carried out as follows:—The patient is in the side position, with her buttocks well over the edge of the bed. The obstetrician stands by

her side facing the foot of the bed, and passes his left hand over the patient's hips, and then between the thighs from the front. With this hand he tries to draw forward the advancing head, by applying his fingers to the scalp. Of course this cannot be done, effectually, until the head is sufficiently advanced for him to get some purchase upon it with the fingers. Meanwhile, the right hand is idle, waiting until the head is sufficiently low for forward pressure to be of avail. Then the heel of the hand is applied between the anus and the tip of the coccyx, and the head is pushed forward and delivered at a suitable moment, *i.e.* between the pains (*v.* Fig. 81).

There are two details, the due observance of which aids in the preservation of the perinæum. First, the head must not be allowed to extend too soon, as the nearer to the neck the point of the occiput round which the head rotates, the smaller will be the sagittal diameter of the head that will distend the perinæum. Extension should therefore be delayed until the lowest possible point of the occiput comes to lie under the symphysis. This is carried out by so pressing the forehead and face forward as to keep the chin in contact with the chest. The correct method of doing this can only be learnt by experience. The second detail is to deliver the head between the contractions and not during a contraction. This is done by trying to check the voluntary efforts of the woman at expulsion; by making her cry out instead of holding her breath; and by taking away the support of her feet, and any towel or rope upon which she may be pulling. Then, when the contraction has passed off, the head may be pressed out as already mentioned.

The moment the head is born, we must determine whether the cord is twisted round the neck or not.

This is done by feeling carefully round the neck. If the cord is there, it is readily felt, and must be immediately set free. The danger of leaving it is, that, if it is a short cord, or if it is several times round the neck, it may not be sufficiently long to permit of the birth of the child without the detachment of the placenta. It can be set free in one of three ways. The usual and easiest method is to pull down a loop of it, and pass this loop over the head of the child; if there is a second turn round the neck, it must be set free in a similar manner. If the cord is drawn so tightly round the neck that it cannot be slipped over the head, we try to slip it over the shoulders. To do this firm pressure is applied to the fundus, and the child driven downwards; as it advances, the cord is slipped, first over one shoulder, and then over the other, and so the child is expelled through the loop of the cord. If neither of these methods are successful, owing to the excessive tightness of the cord, divide the latter with scissors, and deliver the child instantly, by means of pressure upon the fundus and traction upon the head.

While the cord is being set free, the nurse should wipe carefully the eyes of the child, to remove any discharge that may have got into them during the passage of the head through the vagina. This is an important prophylactic measure in the treatment of the purulent ophthalmia of infants.

When the cord has been set free, the remainder of the delivery may be left to nature, provided that the cord is still pulsating; if not, the child must be instantly delivered. In accomplishing this, avoid undue or premature traction on the head, as it may hinder rotation of the shoulders. Pressure from above is much to be preferred to traction from below. Therefore press upon the fundus, and, as the shoulders come down, lift the

child upwards towards the mother's abdomen, so as to allow the posterior shoulder to sweep over the perinæum. Then depress the body again slightly, in order to bring the anterior shoulder from beneath the symphysis. Once the shoulders are born the rest of the child quickly follows, as it is smaller than the part which has gone before.

In persistent occipito-posterior positions, the patient should lie upon the side to which the occiput is turned, as this is said to favour its anterior rotation. If there is delay in the second stage, it is well to try to cause forward rotation of the occiput. This can be done in one of two ways. The first is by passing the whole hand into the vagina and grasping the head, which can then be rotated in such a direction as to bring the occiput forward by the shortest route. The second way is by passing one or two fingers upwards beside the head so that they lie behind the anterior ear, and then as soon as a contraction occurs carrying the fingers steadily and firmly forward along the back of the pubic bone, and past the symphysis until they reach a corresponding position at the opposite side of the pelvis. While they are doing this they will at the same time cause rotation of the head by their pressure against the back of the ear. Whichever method is adopted, the other hand on the abdomen tries to effect forward rotation of the shoulder, so as to make the body follow the rotation of the head.

If there is asynclitism of the head, the cause of the condition must be determined. Its presence suggests the existence of a contracted pelvis, and, if such is found to be the case, the treatment proper to the degree of contraction must be adopted. Anterior asynclitism may be corrected, if the pelvis is normal, by applying an abdominal binder in such a manner as to bring the

axis of the uterus into a proper relation to the axis of the pelvic brim.

Posterior asynclitism differs from anterior, however, in that while a certain degree of the latter is necessary for the passage of the head in a flat pelvis, the former is always of unfavourable import, and must not be allowed to persist. In cases in which no contraction of the pelvis is found, an attempt may be made to correct the asynclitism by means of combined external and internal manipulation of the head. If this attempt fails, or if the condition recurs, podalic version must be performed.

In a normal case, the child will begin to cry as soon as it is born ; if not, any slight cutaneous stimulation will cause it to do so. If there is mucus in the mouth or throat, it must be cleared out *before* attempting to make the child inspire. Then, a dash of cold water or a couple of smart slaps on the body, are the time-honoured methods of promoting inspiration. Lastly, the cord has to be tied, and the child thus separated from the placenta.

Formerly, it was a subject of dispute, whether the cord should be tied the moment the child had cried, or whether the application of the ligatures should be deferred until the cord had ceased to pulsate. White, of Manchester, was one of the first, or the first, to point out the advantages of late ligation, and the correctness of his teaching was finally established by Budin's experiments, which showed that the child receives an additional three ounces of blood by adopting this practice. This influx of blood is due to thoracic aspiration, and the blood thus sucked in goes to fill the additional vessels which are opened by the establishment of the pulmonary circulation. The result of experimental research is to prove that children in whose case late

ligation of the cord has been performed, are more vigorous and regain their original weight more rapidly than those in whose case early ligation has been performed. The cord, therefore, should not be tied until it has stopped pulsating. It is then tied with two ligatures, one applied two inches from the umbilicus of the child, and the other as close as possible to the vulva of the mother. Before applying the second ligature, draw gently on the cord, so as to pull out any loops that may be lying in the vagina; the reason for this will be explained subsequently. The cord is then divided half an inch above the first ligature, and the child removed.

Third Stage.—The indication for treatment in the third stage is to promote the contractions of the uterus, in order to cause the expulsion of the placenta and of any clots which may be present, and to prevent hæmorrhage or the admission of air into the uterine cavity. With these objects in view, we turn the patient on her back the moment the child is born, and lay the hand on the fundus of the uterus. This hand notes the occurrence or cessation of uterine contractions, and also informs us if there is an undue accumulation of blood in the uterine cavity. It should be applied, with its ulnar border backwards, in the direction of the lumbar spine, so then the entire fundus lies in the concavity of the hand, and it cannot become distended with blood without our knowledge. Undue pressure with the hand should be avoided, as it prevents the formation of the retro-placental hæmatoma and the rising of the body of the uterus, and so interferes with the normal mechanism of this stage of labour.

Having the uterus under control, the placenta must next be considered. Two questions may be asked with regard to its delivery. First, how can it be delivered? Secondly, when should it be delivered?

How can the placenta be delivered? It can be delivered :—

- (1) By the natural efforts of the patient.
- (2) By the Dublin method * of expression from above.
- (3) By passing the hand into the uterus, and taking it away.
- (4) By pulling upon the cord, and thus dragging it out.

(1) As the uterus contracts down after the birth of the child, the placental site becomes very greatly reduced in size, so that it is no longer large enough for the placenta. The latter, being too dense to be crumpled up to fit its reduced area of attachment, becomes detached, and lies loose in the uterus. Thence, after several contractions, it is expelled into the vagina. If the case is left entirely to nature, it lies there for some time, and is gradually worked downwards, helped by any contractions of the abdominal muscles that may occur. This is a tedious process, and lasts on an average two or three hours.

It is thus seen that there are two periods in the delivery of the placenta :—

The first period includes the detachment and expulsion of the placenta from the uterus.

The second period includes the expulsion of the placenta from the vagina.

2) Expression by the Dublin method during the first period of placental delivery will materially shorten the third stage. It is, however, very liable to cause

* This method is also known as "Credé's method." It was, however practised in the Rotunda Hospital, and described by M'Clintock and Hardy in their 'Practical Observations on Midwifery,' 1848, several years before Credé taught its use (1853). *Vide* also Barnes, 'Obstetric Operations,' 3rd edition, p. 522.

post-partum hæmorrhage, as the uterine fibres will not have had time to retract properly, and so to obliterate the vessels; also small portions of placenta are frequently left behind. If, however, expression is delayed until the second or vaginal period of placental delivery, then the Dublin method of expression is a most important mode of treatment, and a perfectly safe one.

3) There are the same objections to manual removal during the first period of placental delivery as to expression, with the added objection that the risk of sepsis is very much increased. When the second period has begun, manual removal has no advantage over expression, but rather many obvious disadvantages.

(4) Traction on the cord is the worst of all methods of removing a placenta during the first period of its delivery. As the cord is usually inserted near the centre of the placenta, traction causes detachment of the latter, at first, in the centre. A cavity is thus formed behind the placenta, into which blood is sucked as the cord is pulled upon. This in itself is of no great consequence so long as the amount of blood lost is small. If, however, the further delivery of the placenta is delayed for any cause, such as uterine inertia or dense adhesions between its remaining undetached portion and the uterus, the amount of hæmorrhage may become very serious. Again, if the adhesions between the uterus and placenta are so dense as to prevent separation, strong traction on the cord may cause inversion of the uterus in cases of fundal insertion of the placenta. If the second period of placental delivery has begun, then traction on the cord may be employed to complete delivery. It has, however, no advantages over expression.

The safest and best treatment, then, is to leave the first period of placental delivery to the natural

efforts, while, as soon as the second period has begun, it can be expedited safely by adopting expression, as in the Dublin method.

The foregoing paragraphs also answer the second

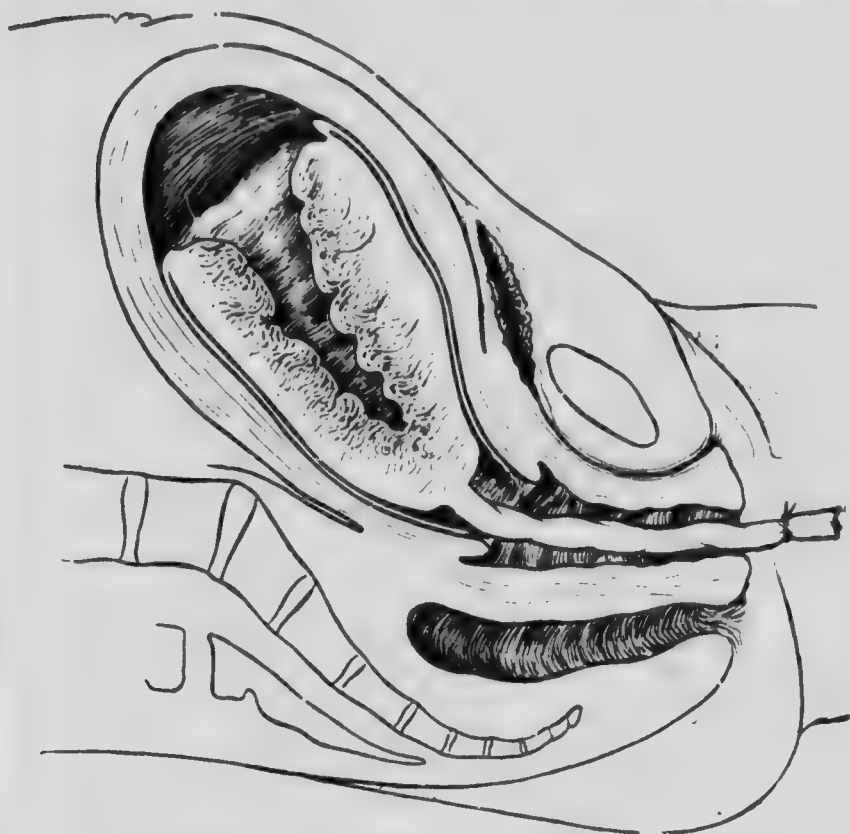


FIG. 82.—Diagrammatic representation of the condition of the uterus and placenta before the expulsion of the placenta from the uterus.

question, *when should the placenta be delivered?* The placenta should be delivered as soon as it has left the uterus, *i. e.* as soon as the second period of its delivery has begun. Premature delivery exposes the patient to the danger of post-partum hæmorrhage and subsequent

sapraemic trouble, by favouring the retention of fragments. Leaving the entire process to the natural efforts means keeping the patient for a longer period than is necessary from the rest she requires.



FIG. 83.—Diagrammatic representation of the condition of the uterus and placenta after the placenta has been expelled into the vagina.

How is it possible to tell when the placenta has left the uterus? There are four indications:—

- (1) *The cord lengthens.* When the cord is being tied two ligatures are used,—one near the umbilicus of the child, the other as close as possible to the vulva of the mother, having first pulled upon the cord slightly, in order to withdraw any portion of it which may be

coiled up in the vagina. As the placenta leaves the uterus and comes into the vagina, it is obvious that the portion of cord outside the vulva will be increased in length; and so the ligature, which originally was tied as close to the vulva as possible, will come to lie four to six inches away from it.

(2) *The fundus rises upwards almost to the level of the umbilicus.* When the child is born, the portion of the uterus above the retraction ring sinks into the thinned-out lower uterine segment and vagina, under the pressure of the abdominal muscles (*v.* Fig. 82). As the placenta is expelled from above the contraction ring, it comes to occupy the place where the upper part of the uterus had been; and, consequently, the latter is pushed upwards out of the pelvis, and the fundus is felt at or above the level of the umbilicus (*v.* Fig. 83).

(3) *The mobility of the uterus is increased.* When the uterus has partially sunk into the pelvic cavity with the placenta inside it, it is supported on all sides by the pelvic brim, and cannot readily be moved from side to side (*v.* Fig. 83). But, as it rises, it loses this support, and becomes poised—if the term may be used—on the top of the placenta, and so can be moved about with ease from side to side. This is well shown in the diagram. The uterine body is also noticeably smaller after the placenta has left it.

(4) *The abdominal wall bulges forward above the pubes.*—This is due to the presence of the placenta in the vagina, or in the lower uterine segment. The placenta, lying there, pushes forward the anterior vaginal wall, and in front of it the bladder and the abdominal wall, thus simulating the appearance caused by a full bladder (*v.* Fig. 83).

As soon as we know by these signs that the uterus is empty, the placenta may be expressed by the Dublin

method. To do this, grasp the fundus with one or both hands during a contraction, and press it downwards and backwards in the direction of the last piece of the sacrum (*v.* Fig. 84). By this means the uterus is pressed down into the vagina, and the placenta is driven out before it. The latter is immediately supported by the hands of the nurse, and gently drawn downwards in

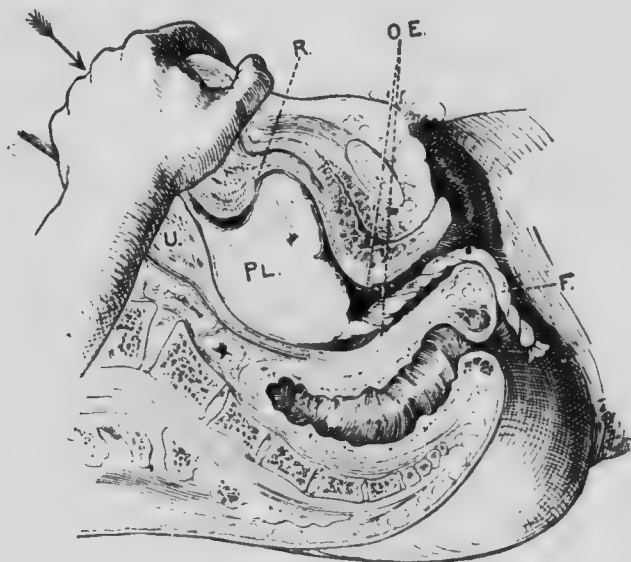


FIG. 84.—The Dublin method of expressing the placenta from the vagina. PL. Placenta. U. Uterus. R. Retraction ring. O.E. Os externum. F. Funis.

such a manner as to cause the uniform stripping of the membranes off the inside of the uterus.

Let us repeat in a few words the management of the third stage. The moment the child is born the patient is turned on her back, and the doctor or nurse places one hand gently on the fundus. As soon as the cord has ceased pulsating, it is tied by the nurse, as described above, and the child separated. If the bladder is full it

ought to be emptied, as pressure applied over a distended bladder causes an unnecessary amount of pain. Nothing further is done until the placenta has left the uterus. As soon as this occurs, the placenta is expressed from the vagina, seized in the hands, and drawn gently downwards, so as to bring away the membranes entire. The third stage is thus completed, and nothing remains but to wash all blood off the patient and to apply to the vulva a sanitary towel or diaper, which has been sterilised either by heat or by prolonged soaking in corrosive sublimate, and a tight abdominal binder. During all this time, the hand must be kept on the fundus, in order to prevent the uterine cavity from filling with clots. It should not be removed until the last pin of the binder has been inserted. Finally, the nurse or doctor must examine the uterus every now and then for an hour or so after delivery by placing the hand over it, in order to be sure that it remains properly contracted.

The importance of applying sterilised dressings to the vulva, both immediately after delivery and during the puerperium, is not as generally appreciated as it ought to be. The vulva and vagina are at this time, to all intents and purposes, identical with an open surgical wound, and should be treated accordingly. If dressings sterilised by heat cannot be obtained, an antiseptic dressing may be used instead. The simplest method of preparing this is to cut up pads of gamgee tissue at the beginning of labour, and to put them in a basin of corrosive sublimate lotion. They are then ready for use when required.

Ergot.—Ergot is undoubtedly of service at certain times, but given at the wrong time it is most dangerous. The contractions caused by ergot are tonic and not intermittent, and so they differ from the physiological contractions of the uterus. This fact indicates the time at

which ergot may be given. It may be given, when tonic contraction of the uterus is not dangerous to mother or child, and with few exceptions, this is only when the uterus is empty. If ergot is given during the first stage of labour, it delays the dilatation of the os, and causes dangerous pressure upon the child. In the second stage, ergot is dangerous, unless it is certain that there is no obstacle to the rapid birth of the child. This excludes its use in most cases. In the third stage it is also contra-indicated, as it may cause incarceration of the placenta. Then, if hæmorrhage occurs, the condition of affairs is very serious. Hæmorrhage, occurring during the third stage, usually requires the removal of the placenta; but, if ergot has been given, the region of the retraction ring may be so tightly contracted that this is impossible.

When, therefore, may ergot be given? It may be given when the uterus is empty, in order to promote tonic contraction, and in only very few cases is it advisable to give it during any of the three stages of labour. It may be given as a routine treatment as soon as the placenta comes into the vagina, or even a little sooner, if we are prepared to take away the placenta before the ergot begins to act. Ergot, given by the mouth, causes uterine contractions in from ten to fifteen minutes. The Pharmacopœial dose—up to forty minims—is too small; the usual dose is one drachm, but from one to two drachms may be given with safety. Ergot, given hypodermically, acts in five minutes, or even less. Up to one twenty-fifth of a grain of the citrate of ergotinin may be given.

Pituitary Extract.—The use of pituitary extract as a means of increasing the strength of the uterine contractions has received considerable attention of late. According to some observers it differs from ergot in

that it can be given safely during the first and second stages of labour without causing tonic contractions and danger to the child or to the uterus. Its use in this respect will be discussed later when considering uterine inertia (*v.* Chap. XXII). It apparently possesses one peculiarity, namely that if given more than an hour before the birth of the foetus its action passes off very quickly after birth, and there may then be inefficient uterine action leading to post-partum hæmorrhage. On the other hand, if given shortly before birth or during the third stage it causes firm contraction of the uterus, which

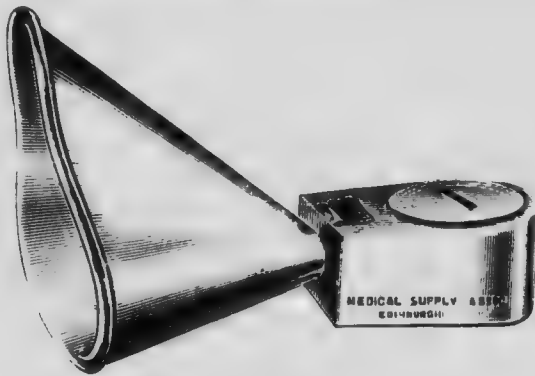


FIG. 85.—Murphy's chloroform inhaler.

is readily again induced by massage, even if it ceases temporarily. The usual hypodermic dose of the pituitary extract is from a half to one cubic centimetre (grs. $7\frac{1}{2}$ -15).

Anæsthesia.—The use of an anæsthetic during labour is of frequent occurrence, but the degree of anæsthesia necessary is not always the same. Two classes of patients are met with—those in whom anæsthesia is induced solely to relieve pain, and those in whom, in addition to relieving pain, it is necessary to relax the abdominal muscles in order to perform some operation; that is to say, there are two degrees of anæsthesia employed during labour :—

- (1) Partial or so-called "obstetrical" anaesthesia.
- (2) Complete or surgical anaesthesia.

(1) *Obstetrical anaesthesia* may be adopted in all labour cases with the object of relieving pain. It does not tend to asphyxiate the child unless unduly prolonged—more than four hours—to check labour pains, or to favour the occurrence of post-partum hæmorrhage. On the contrary, many patients who will not "bear down," owing to a dread of increasing the pain, will do so when "obstetrically" anaesthetised. The best anaesthetic for the purpose is undoubtedly chloroform, and one of the best means of administering it is by "Murphy's inhaler" (*v.* Fig. 85). This inhaler is made of metal, and consists of a chamber containing a sponge, on which the chloroform is poured, and a face-piece, either oral, or oro-nasal. There are two valves, usually made of rubber, which allow only *inspirations* to pass through the chloroform chamber. To use the inhaler, a teaspoonful of chloroform is placed on the sponge, and the cap applied. The patient is then given the inhaler to hold, and shown how to put it to her mouth and breathe through it. She does this when a contraction is beginning with the result that she becomes semi-unconscious, and allows the inhaler to fall. Then, as consciousness returns, she again breathes through it, and so on. In this way a sufficient degree of anaesthesia is maintained, and at the same time the doctor and nurse can, if necessary, attend to other things. Anaesthesia should not be started until the patient has passed into the second stage of labour.

Another method of obtaining obstetrical anaesthesia is by the hypodermic injection of a suitable mixture of scopolamine and morphine. The usual method of administration is to give from $\frac{1}{120}$ to $\frac{1}{100}$ gr. of scopolamine hypodermically combined with morphine $\frac{1}{6}$ to $\frac{1}{4}$ gr.

A smaller dose of scopolamine alone may be repeated in three hours if necessary. When this form of anæsthesia is used it is advisable that the patient should be under medical supervision during the whole time she is under the influence of the drugs.

(2) *Surgical anæsthesia* is necessary in order to facilitate the performance of many obstetrical operations. Chloroform is again the most suitable anæsthetic, as it is most easily administered. If, however, there are any grave contra-indications to its use, ether must be substituted. The easiest mode of administering chloroform is on a Skinner's mask, or on a handkerchief. Chloroform must never be administered in the immediate neighbourhood of a candle or lamp, as such light decomposes it into chlorine gas and hydrochloric acid. Inhalation of these may set up a most serious pneumonia.

CHAPTER X.

CEPHALIC PRESENTATIONS (*continued*).

Face Presentation: Frequency—Ætiology—Positions—Diagnosis—Mechanism—Abnormal Mechanism—Moulding of Head—Treatment—Prognosis. Brow Presentation: Frequency—Ætiology—Positions—Diagnosis—Mechanism—Moulding of Head—Prognosis—Treatment. Anterior Fontanelle Presentation. Posterior Fontanelle Presentation.

FACE PRESENTATION.

FACE presentation occurs when the head becomes fully extended (*v.* Fig. 87). It is, so to speak, a *secondary* or *resultant* presentation, and, save in rare cases of fœtal malformation, only occurs after the beginning of labour.

Frequency.—For the reasons explained under the mechanism of vertex presentation, this presentation is rare (*v.* page 8). Its average proportion is usually stated to be 1 in 250. At the Rotunda Hospital amongst 35,000 cases of immature, premature, and full term labour, the relative frequency of face presentation was 1 in 394·42, *i. e.* 0·25 per cent.

Ætiology.—Face presentation may arise in three ways. It may be due to:—

(1) Anything that prevents flexion; *e. g.*,—tumours about the neck of the child, enlarged thyroid, and hydrothorax.

(2) Anything that tends to arrest the occiput at the brim, whilst at the same time permitting descent of the forehead ; *e. g.*,—obliquity of the uterus, contracted pelvis,

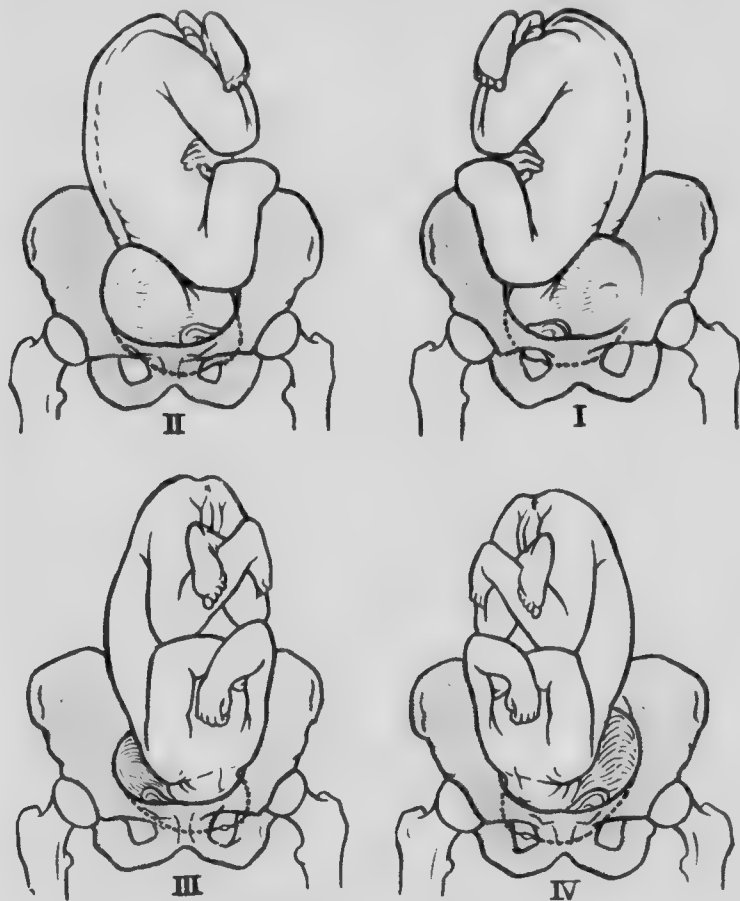


FIG. 86.—The four positions in which the foetus may lie in face presentation.

or small tumours about the brim. In lateral obliquity of the uterus the head of the child, instead of being driven directly downwards into the brim, is driven against the opposite side of the brim, the result being,

that the descent of the *occiput* is arrested, and the descent of the chin is favoured.

(3) Malformation of the child's head; *e.g.*,—a congenital dolichocephalic head *i.e.* a head, the occiput of which is unduly prominent. It is easy to understand that, if such a thing as a congenital dolichocephalic head



FIG. 87.—Face presentation. The foetus as felt by abdominal palpation.

exists, it would favour face presentation (*v.* page 146). We must, however, bear in mind that the moulding which the head undergoes in a face presentation causes dolichocephalism, and that, therefore, what we imagine to have been the cause of a face presentation, may in reality only be the result of it.

Positions.—Four positions are recognised :—

- 1st position, back to the left and in front.
- 2nd position, back to the right and in front.
- 3rd position, back to the right and behind.
- 4th position, back to the left and behind.

The first position is the most common.

Diagnosis. — **Abdominal Palpation.** — The pelvic pole of the foetus is found at the fundus of the uterus, and is recognised by the characteristics which have already been mentioned. The body of the foetus lies vertically, with the back towards one or other side, according to the position. If the back is posterior, the limbs are felt with greater distinctness than in the case of a vertex presentation, owing to the extension of the head, which forces the abdominal wall and limbs of the foetus into close contact with the anterior uterine wall. For a similar reason, the back, if anterior, lies at a deeper level in the uterus, and is felt with greater difficulty, than in a first or second vertex presentation. The head is found in the lower pole of the uterus, if it has not passed below the brim. The occiput forms a rounded and prominent tumour, which completely fills the pelvic brim on the side corresponding to the back of the foetus. The chin is felt as a small tumour "like an animal's hoof" (Budin), resting on the brim on the same side as the limbs. The occiput lies at a higher level than the chin, and the groove of the neck runs obliquely in a corresponding direction. If the head has passed below the brim, the fingers can be sunk deeply into the pelvis on the side of the limbs, while on the side of the back they are stopped by the prominence formed by the occiput.

The position of the foetus is ascertained by noting whether the back is turned to the left or the right, and anteriorly or posteriorly.

Vaginal Examination. — At the onset of labour, the

presenting part can be reached only with difficulty through the vagina, as the face is delayed for some



FIG 88.—The four positions of the fetal head in face presentation, as felt from below.

time above the brim. If the membranes are not ruptured, we can feel their conical protrusion into the vagina (*v.* page 66). Later on, as the head descends, the presenting part can be felt ; but there is considerable

difficulty in ascertaining what it is. As a result of the long labour, a large caput succedaneum forms upon the face, and causes it to resemble a breech. The diagnostic points are the supra-orbital ridges, the malar bones, and the mouth, which has to be distinguished from the anus (*v.* pp. 64, 225) (Fig. 88). If the nature of the presenting part cannot be thus determined, try to pass a finger upwards, between the presenting part and the side of the pelvis. In the case of a breech we come upon the angle of the groin, in the case of a face upon the ear. In examining a face presentation by vaginal examination, particular care must be taken not to injure the eyes. It is said that the introduction of the finger into the mouth may cause attempts at inspiration on the part of the child, and so lead to blocking of the air-passages by liquor amnii or mucus.

The position of the foetus is ascertained by noting the relations of the different bony landmarks of the face to one another and to the pelvis (*v.* Fig. 88).

Auscultation.—The foetal heart is heard at a higher level than in a vertex presentation, and, in cases in which the chin is directed anteriorly, is best heard over the limbs instead of over the back, as is usual in vertex or breech presentations. This is due to the fact that the chest and limbs of the child are pressed against the abdominal wall of the mother, while the back is far away from it.

Mechanism.—The diameters of the head that come into play in a face presentation are :—the cervico-bregmatic, $3\frac{3}{4}$ inches; and the bi-parietal, $3\frac{3}{4}$ inches. The actual measurement of the cervico-bregmatic diameter is almost the same as that of the sub-occipito-bregmatic, but it cannot be reduced to the same extent by moulding. The mechanism of face presentation resembles, very closely, that of vertex presentation, if extension is sub-

stituted for flexion, flexion for extension, and the chin for the occiput. The various steps are as follows :

(1) and (2).— **Descent and Extension.**—The face engages with its cervico-bregmatic diameter in the transverse diameter of the pelvis, or, according to some writers, in one of the oblique diameters. As the head descends, it at the same time extends until the occiput



FIG. 89.—Face presentation. Extension complete ; internal rotation beginning.

is almost in contact with the back of the child (*v.* Fig. 89).

(3) **Internal Rotation.**—Descent continues until the face reaches the pelvic floor, and then, obedient to the rule of internal rotation (*v.* page 150), the chin, which is lowest, rotates in front (*v.* Fig. 90). It is characteristic of face presentations, that internal rotation occurs at a much later stage, and takes a longer time to be com-

pleted, than in vertex presentations; so much so, that the swollen face may have appeared at the vulva before rotation begins.

(4) **Flexion.**—The chin now lies under the symphysis, and the head rotating round the latter is born by flexion; first the mouth and nose, then the eyes,



FIG. 90.—Face presentation. Internal rotation complete, flexion beginning.

forehead, and occiput appearing from above the perineum (*v.* Fig. 91).

(5) **External Rotation.**—External rotation occurs as in a vertex presentation, and consists of restitution and external rotation proper. The chin turns back to the side at which it originally lay.

Abnormal mechanism.—In some cases probably owing to incomplete extension of the head, the chin of the child rotates posteriorly into the hollow of the sacrum. This

is a practically hopeless condition for the child unless either the head is very small or the pelvis very large.

Moulding.—In face presentation, the cervico-bregmatic, sub-occipito-bregmatic, supra-occipito-mental, and bi-parietal diameters are diminished, while the occipito-frontal and occipito-mental diameters are increased (cf. Fig. 92). The caput succedaneum forms over the face



FIG. 91.—Face presentation. Flexion is nearly complete, and the head is being born.

and may cause extreme distortion owing to the increased duration of labour, and the nature of the tissues involved. The swelling, however, passes off in a few days.

Treatment.—A face presentation can be treated in three ways :—

- (1) It may be allowed to remain a face and treated accordingly.
- (2) If recognised in time it may be changed to a vertex.

(3) Podalic version may be performed

(1) If we decide to allow a face presentation to persist, or if it is too late to alter it, it is well to warn the patient's friends that the labour will probably be tedious and that there is considerable danger for the child, as well as marked temporary disfigurement. The treatment of all abnormal presentations in the first stage prevails. Keep the patient in bed, and avoid anything likely to cause rupture of the membranes. Let her lie upon the side at which the chin is, as this favours its anterior rotation. As the face approaches the perineum, it is well to examine, to determine if this anterior rotation is occurring. If we think it is not, it can be assisted to do so. Bear in mind the law which governs internal rotation (*v.* page 150), and press the forehead upwards during a contraction. This causes the chin to become the lowest part of the face, and so favours its anterior rotation. If this still does not occur, an attempt may be made to rotate the face manually, by grasping it with the finger of one hand introduced into the vagina. The head is made to rotate in whichever direction will bring the chin anterior by the shortest route, and, at the same time, the external hand pushes the anterior shoulder in the same direction as the face is being turned. This is all that can be done to help the case. The application of the forceps is dangerous for the child, unless internal rotation has occurred. After this has occurred, the forceps is very rarely necessary, except when delay is due to uterine inertia (*v.* Chap XXII). If the chin rotates posteriorly and cannot be turned to the front, perforation is usually necessary.

(2) If a face presentation is diagnosed early, and it is decided to change it to a vertex, the method of Schatz is the most suitable. It requires, for its performance, three conditions to be present:—

- (a) Unruptured membranes.
- (b) The face not yet fixed in the brim.
- (c) A lax abdominal wall.

To obtain the last an anæsthetic is usually necessary, though it need not be given if the patient will refrain from straining. The details of the operation are as follows:—Anæsthetise the patient and palpate the abdomen carefully in order to ascertain the position of

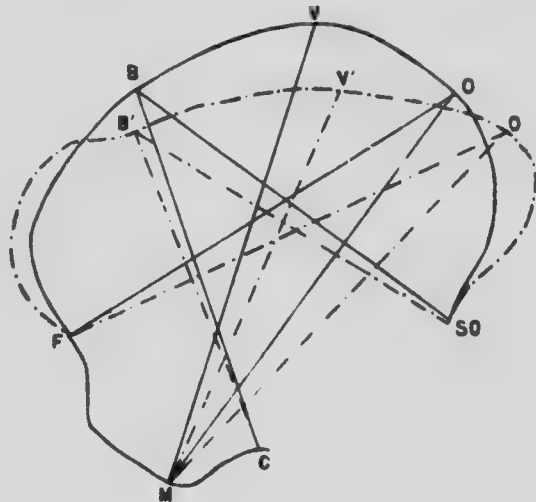


FIG. 92.—Face presentation. The moulding of the fetal head. The dotted outline shows the shape of the moulded head, the firm outline of the unmoulded head. (*Budin.*)

the child. Then, sitting by the side of the patient and facing her feet, place both hands upon the shoulder and back of the child, and draw them directly upwards out of the pelvis. Next, with one hand on the chest, push the latter in the direction of the child's back, while the other hand on the breech pushes it in the opposite direction. Lastly, push the breech directly downwards towards the pelvis, apply a tight binder, and, if the

vertex does not fix, rupture the membranes (*v.* Fig. 93). The danger of this method is, that complete flexion of the head may not be obtained, and so a brow presentation result.

If Schatz' method does not succeed, the presentation may be changed by combined internal and external manipulation. If the cervix is only partially dilated, the method of Baudelocque may be tried. Place the patient in the cross-bed position, and introduce into the vagina the hand which corresponds to the side towards

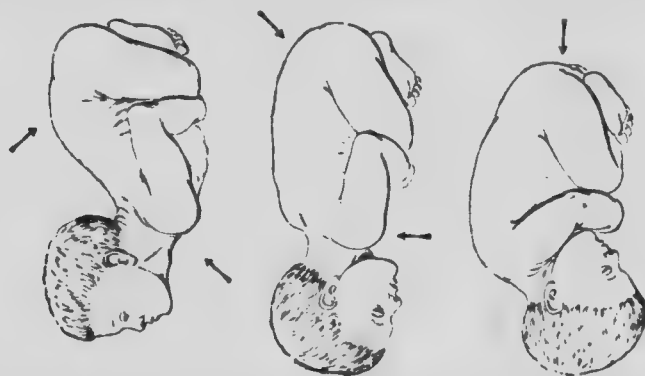


FIG. 93.—Schatz' method of converting a face into a vertex. The arrows show the directions in which the body of the child is pushed. (*Lusk.*)

which the face is turned, and pass two fingers into the uterus. Then, by pressure, first upon the lower jaw, next upon the upper jaw, and finally upon the forehead push the face upwards, while at the same time the other hand pushes down the occiput from without. If the os is sufficiently dilated, the entire hand may be passed into the uterus and the whole face grasped and pushed upwards. In all cases an assistant must push the shoulders of the child in the direction of its back and the breech in the opposite direction while efforts are being made to alter the posi-

tion of the head, as these efforts will fail unless the attitude of the child's body is at the same time altered.

An alternative method, which may be tried if the os is sufficiently dilated, is that recommended by Partridge. It consists in introducing into the uterus the hand which corresponds to the side towards which the vertex is turned, and passing it upwards until the fingers lie over the occiput. The occiput is then grasped, and drawn downwards, while at the same time the outside hand pushes the chest of the child upwards and in the direction of the back.

(3) If none of the foregoing methods succeed, or if, after their performance, the face presentation returns, and if we have any reason to think that the fœtus will not be delivered spontaneously as a face presentation, it is best to turn the presentation into a breech and to bring down a foot. This course is, however, only possible if the head is still free at the pelvic brim.

We may sum up the treatment of face presentation in a few words. If the fœtus and the pelvis are of normal size and if the mother is a multipara allow the presentation to persist. Avoid anything likely to cause premature rupture of the membranes, and do not apply the forceps except as a last resource. If there is any reason to think that the fœtal head is large in proportion to the size of the pelvis, or if the mother is a primipara, try to change the presentation into a vertex, and if this cannot be done perform podalic version. If the child dies during labour and the presenting part is not advancing, and an indication for delivery arises, perform craniotomy.

Prognosis.—The mortality in face presentation is somewhat higher for the mother and considerably higher for the fœtus, than in vertex presentation. The fœtal mortality is usually estimated at 13 per cent.

BROW PRESENTATION.

The fœtus is said to present by the brow when that part of the head between the supra-orbital ridges and the anterior fontanelle lies lowest (*v.* Fig. 96). A brow presentation, like a face presentation, is a secondary or resultant presentation, occurring after labour has begun.

Frequency.—The proportion of cases in which a brow presentation occurs is difficult to ascertain, as in many

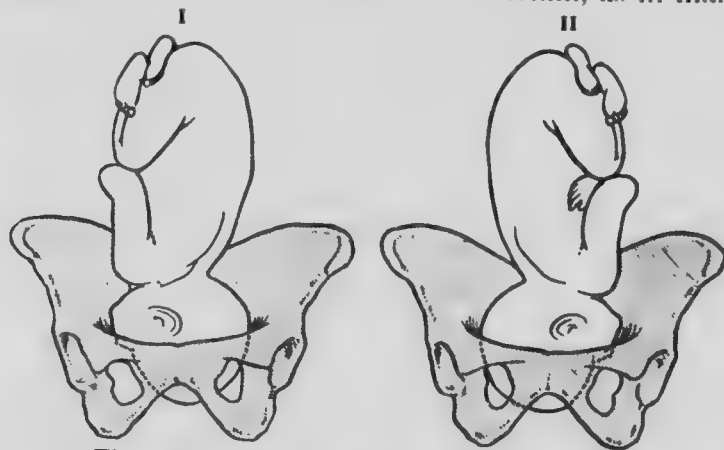


FIG. 94.—The two positions in which the fœtus may lie in brow presentation.

cases of brow presentation, flexion recurs and a vertex again results, or extension continues and a face presents. The proportion of cases in which a brow is either recognised and changed, or remains unchanged, is said to be about 1 in 500. At the Rotunda Hospital in 35,000 cases of immature, premature, and full term labours, the relative frequency of brow presentation was 1 in 622·77 *i.e.* 0·16 per cent.

Ætiology.—The causes of a brow presentation are very similar to those of a face presentation (*v.* page 196).

Positions.—As the head almost always engages transversely in these cases, it is unnecessary to recognise more than two positions, as follows :—

1st position—back to the left.

2nd position—back to the right.

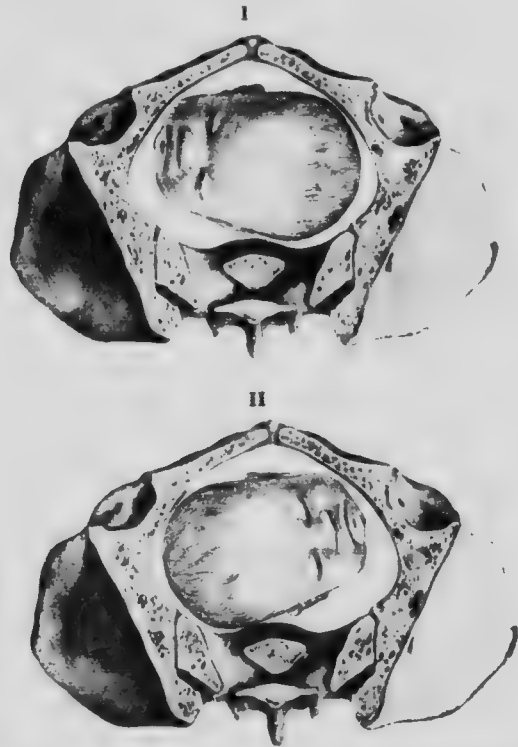


FIG. 95.—The two positions of foetal head in brow presentation as felt from below.

In all probability the first position is the more common.

Diagnosis.—**Abdominal Palpation.**—Nothing characteristic is noticed in the attitude of the body of the child. On making the pelvic grip, the head will be found to lie well above the brim at the beginning of

labour, with the chin and occiput on the same level (Fig. 96). The position of the foetus is ascertained by noting the relation of its back to the middle line of the mother.

Vaginal Examination.--The presenting part can



FIG. 96.—Brow presentation. The foetus as felt by abdominal palpation.

only be reached with great difficulty at the beginning of labour, owing to the high situation of the head. The membranes are felt bulging in a cone-shaped tumour, as is usual in abnormal presentation. Later in labour if the head descends, the presentation is characteristic. On one side of the pelvis, is felt the anterior fontanelle

and the smooth frontal bone with its median suture; on the other side, the supra-orbital ridges, the hollows of the eyes, and the prominent malar bones.

The position of the fetus is ascertained by noting the side of the pelvis to which the smooth forehead and the irregular face are respectively turned.

Auscultation. The heart is heard slightly to one



FIG. 97.—Brow presentation. Head engaging in the brim.

or other side of the median line, according to the position of the back of the child.

Mechanism. — The diameters of the head, which engage in the brim in brow presentation, are the supra-occipito-mental ($3\frac{1}{2}$ inches), and the bi-parietal ($3\frac{3}{4}$ inches). In many cases the head does not enter the brim at all. If it enters the brim, the supra-occipito-mental diameter of the head lies in the trans-

verse diameter of the pelvis. Four possibilities are then present :—

- (1) With a small head or a large pelvis a brow presentation may be born unchanged.
- (2) A brow presentation may be converted into a vertex presentation.
- (3) A brow presentation may be converted into a face presentation.



FIG. 98.—Brow presentation. Internal rotation complete.

- (4) The head may become impacted in the pelvis.

If a brow presentation is to be born unchanged, internal rotation must take place in such a direction that the face rotates forward (*v.* Fig. 98). The jaw then fixes behind the symphysis, and the head rotating round the latter, the cranial vault sweeps over the perinæum, and lastly the face descends from behind the symphysis.

Moulding.—In brow presentation the sub-occipito-bregmatic, the supra-occipito-mental and the bi-parietal diameters are diminished; while the occipito-frontal, the occipito-mental and the sub-occipito-frontal diameters are increased (c. Fig. 99). The caput succedaneum is formed over the most prominent part of the forehead, and is usually of large size.

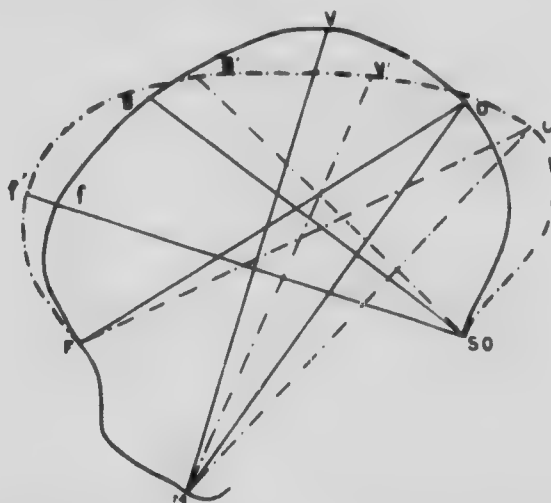


FIG. 99.—Brow presentation. The moulding of the foetal head. The dotted outline shows the shape of the moulded head, the firm outline of the unmoulded head. (*Budin.*)

Treatment.—The first thing to understand clearly is, that a brow presentation is never to be left uncorrected, if it can be changed, unless we are sure that the head of the foetus is small relatively to the size of the pelvis. If it cannot be changed into either a vertex or a face presentation, and if it is too late to perform podalic version, expulsion is best left to the natural efforts alone. Nature will frequently correct a case which we cannot. The forceps should never be used except as

the last chance before perforation, and if the face is posterior it is probably useless even to try it. A brow presentation can be corrected in three ways:—

- (1) By completing flexion, *i.e.* by turning it into a vertex presentation.
- (2) By completing extension, *i.e.* by turning it into a face presentation.
- (3) By version and bringing down a foot.

(1) If the brow is free above the brim, or at any rate not too deeply engaged, the presentation may be converted into a vertex by Schatz' method (*op. cit.* page 205), or, if this fails, by the following method:—The operator, with one hand in the vagina, pushes the head upwards out of the pelvis, directing his force especially against the forehead so as to favour flexion. An assistant then presses the child's shoulders in the direction of its back, as in Schatz' method (*op. cit.* page 205). Flexion is finally completed, either by pushing the occiput downwards into the pelvis by pressure through the abdominal wall, or by pulling it down with the vaginal hand, which has been passed above it. The head is then kept in this position by means of a tight binder, and the membranes ruptured, if this has not been already done.

(2) If the brow is too far down in the pelvis to be altered to a vertex, we may try to alter it into a face. This is best done by pressing upwards at each side of the large fontanelle during a contraction, as this will tend to cause the descent of the chin. It will probably be unsuccessful, except in those cases in which the uterine contractions would have brought about the same result.

(3) Podalic version should be performed whenever possible if, after a vertex presentation has been obtained, the head returns to its original position.

If a brow presentation cannot be corrected, similar

precautions are taken as have been described under the treatment of face presentation (*v.* page 205). The patient lies on the side towards which the face is turned in order to favour its rotation forwards.

If at any time the child is found to be dead, perforation should be performed, unless the head is about to be delivered by the natural efforts.

Prognosis.—The maternal and foetal mortalities are considerably higher in this presentation than in vertex or face presentation, owing to the increased length of labour.

ANTERIOR FONTANELLE PRESENTATION.

Definition.—Anterior fontanelle presentation is the term applied to the presentation when the head lies in a position midway between a vertex presentation and a brow presentation, the anterior fontanelle lying lowest (*v.* Fig. 100).

Ætiology.—Anterior fontanelle presentation, when found at the brim, is the result of a flat pelvis. When found in the pelvic cavity it is usually associated with a persistent occipito-posterior position of the head. In the former case the descent of the anterior fontanelle is due to the fact that the posterior transverse diameters of the head are greater than the anterior, and that consequently the descent of the vertex is retarded, while the sinciput descends more readily.

Diagnosis.—Anterior fontanelle presentation cannot often be recognised by abdominal palpation. It is diagnosed by vaginal examination, by noting the position of the anterior fontanelle.

Mechanism.—In a flat pelvis, the head engages with its antero-posterior diameters in the transverse diameter of the brim, and then, in consequence of the obstruction

offered to the descent of the bi-parietal diameter by the narrow conjugate, it glides slightly towards the side of the pelvis at which the occiput lies. In this manner, a narrower diameter than the bi-parietal is brought into the conjugate diameter, and at the same time a slight degree of extension is produced, so bringing the anterior fontanelle lowest. The contractions of the uterus continuing, the head is then driven down through the brim.

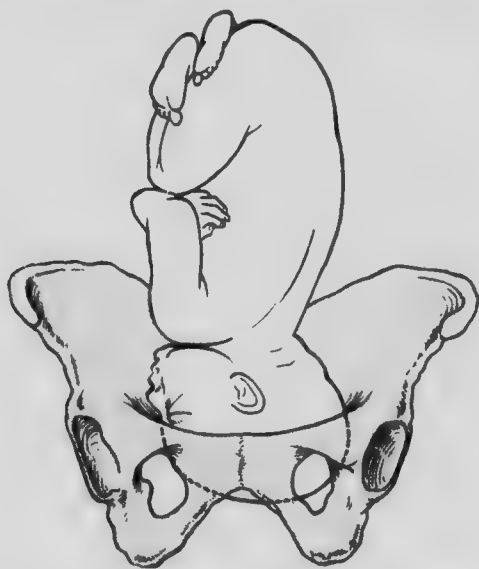


FIG. 100.—Anterior fontanelle presentation. Head engaging in the brim.

There is, at the same time, a corresponding degree of anterior asynclitism (*v.* page 158), according to the degree of contraction present.

Treatment.—As this presentation is the rule in flat pelvis, it must be encouraged to persist until the fore-part of the head has passed the brim. Accordingly, the patient is placed at the beginning of labour on the side at which the anterior fontanelle is. Subsequently—when the sinciput has passed the brim—she is

placed on the opposite side in order to facilitate the descent of the posterior fontanelle.

When presentation of the anterior fontanelle is found after the head has descended into the pelvic cavity, the treatment as already described for persistent occipito-posterior position is adopted (*v.* page 157).

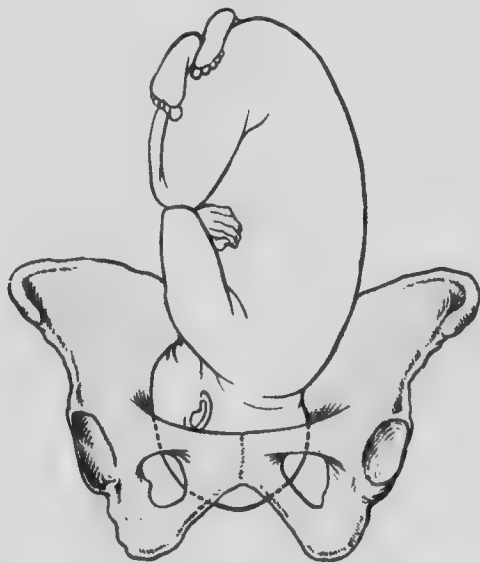


FIG. 101.—Posterior fontanelle presentation. Head engaging in the brim.

POSTERIOR FONTANELLE PRESENTATION.

Definition.—Posterior fontanelle presentation is the term applied to the presentation when the head lies in a fully flexed position, the posterior fontanelle lying lowest (*v.* Fig. 101). It is sometimes termed Roederer's obliquity.

Etiology.—Posterior fontanelle presentation, when found at the brim, is the result of a generally contracted pelvis, of a generally contracted and flat pelvis,

or of a very large foetal head in a normal pelvis. In such cases it is due to the increased resistance to the descent of the head. When it is found in the pelvic cavity, it is part of the ordinary mechanism of a vertex presentation.

Diagnosis.—The diagnosis is made by vaginal examination, by determining the low position of the posterior fontanelle.

Mechanism.—There is nothing special to note in the mechanism of a posterior fontanelle presentation. If the disproportion between the head and the pelvis is great, delivery will be impossible.

Moulding.—The occipito-mental diameter is greatly lengthened, while the sub-occipito-bregmatic is more reduced than is normally the case. The result of this is that the head looks as if it had been drawn out.

Treatment.—When the posterior fontanelle presents at the brim, an attempt must be made to discover the cause. If the cause is pelvic contraction, the degree of contraction must be determined, and the treatment proper for such degree adopted (*v.* page 403). If the pelvis is normal the head must be allowed to mould for as long as possible. As soon as an indication for delivery occurs, the forceps must be tried. If it fails to deliver the fetus, perforation will be necessary.

CHAPTER XI.

PELVIC PRESENTATION.

Pelvic Presentation: Frequency—Ætiology—Positions—Diagnosis—Mechanism—Abnormal Mechanism—Moulding—Treatment—Method of bringing down an Extended Arm—Method of delivering the After-coming Head; a Modification of the Prague Method, Martin's Method, Smellie's Method—Prognosis.

THE term pelvic presentation includes all cases in which the lower pole of the fœtus presents. Pelvic presentations are subdivided into:—

(1) Complete pelvic presentation, in which the breech and feet descend together (*v.* Fig. 103).

(2) Incomplete pelvic presentation, in which:—

(a) The breech descends alone, the legs being directed upwards along the body of the fœtus.

(b) One or both knees descend first.

(c) One or both feet descend first.

In considering the mechanism no difference need be made between complete and incomplete presentations.

Frequency.—The proportion of cases in which pelvic presentation occurs, varies from 1 in 80 in primiparæ, to 1 in 23 in multiparæ; knee presentation occurs about once in 800 births. At the Rotunda Hospital the relative frequency of pelvic presentation amongst 35,000 cases of immature, premature, and full term labours was 1 in 32·77, *i.e.* 3·08 per cent.

Ætiology.—The causes of cephalic presentation have

been already mentioned, namely :—the uterus is of an ovoid shape, and the foetus in its usual attitude is also of an ovoid shape ; the fundus is the larger pole of the uterus, and the podalic pole is the larger pole of the

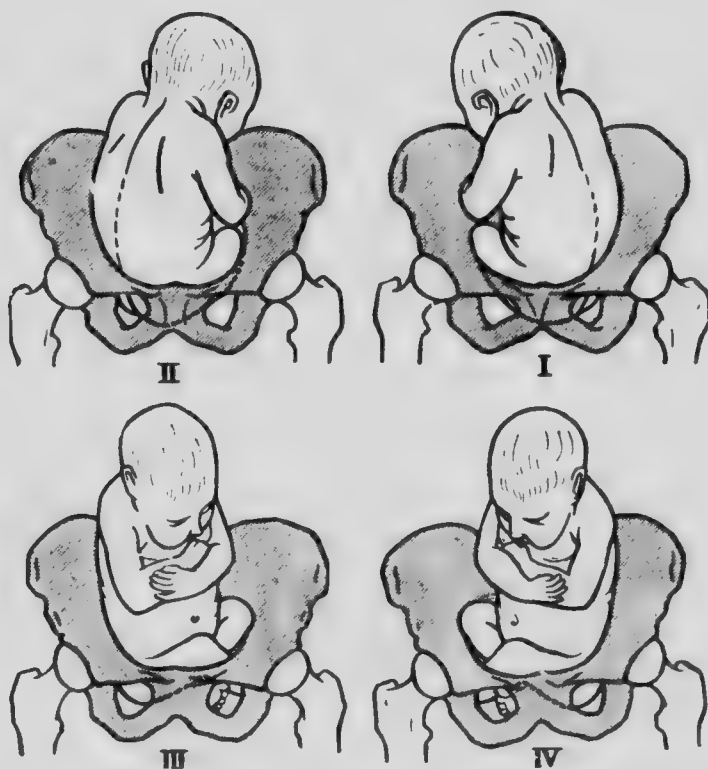


FIG. 102.—The four positions in which the foetus may lie in pelvic presentation.

child. Accordingly, under normal circumstances, the breech is to be found at the fundus, and the head at the pelvic brim. Anything, therefore, which tends to change the shape of the uterus, or of the child, may be considered to be a cause of mal-presentation, and especially of breech presentation.

The principal of these causes are :—

- (1) *Multiparous uterus.* The uterine walls are lax.
- (2) *Contracted pelvis.* The head is unable to adapt itself to the lower uterine segment.
- (3) *Twins.* The uterus is over-distended.
- (4) *Hydramnios.* The uterus is also over-distended.



FIG. 103.—Pelvic presentation. The foetus as felt by abdominal palpation.

(5) *Placenta prævia.* The placenta fills up the lower uterine segment, and so changes the shape of the uterine cavity.

(6) *Hydrocephalic head.* The cephalic pole of the foetus is larger than the podalic pole.

(7) *Premature children.* The foetus does not fill the uterine cavity, and, consequently, is not guided into its normal position.

(8) *Tumours, and faulty development, of the uterus.*

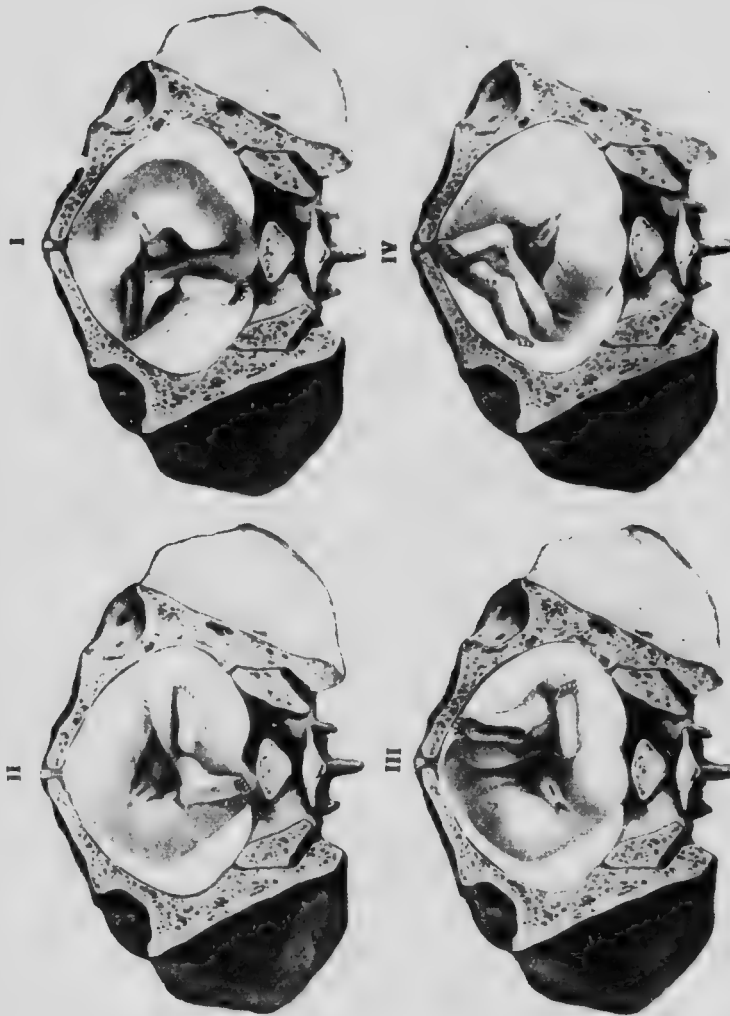


FIG. 104.—The four positions of the fœtal breech in pelvic presentation, as felt from below.

Positions.—Four positions are recognised :—
1st position, back to the left and in front.

2nd position, back to the right and in front.

3rd position, back to the right and behind.

4th position, back to the left and behind.

The first position is slightly more common than the other positions.

Diagnosis.—**Abdominal Palpation.**—By this we determine that the foetus is presenting by one or other pole, and that the opposite pole is at the fundus. The pole at the fundus is rounded, smooth, and ballottes easily from side to side independently of the back; there is, moreover, a groove between it and the back. This distinguishes it at once as the head. To confirm this diagnosis we palpate the presenting pole. It is tolerably round and hard, but it does not ballotte nor move independently of the back, and, in a favourable case, the thighs can be felt springing from it, and the feet lying beside it.

The position of the foetus is ascertained by noting whether the back is turned to the left or the right, and anteriorly or posteriorly (*v.* Fig. 102).

Vaginal Examination.—The diagnosis can also be made by vaginal examination, but it is rather more difficult to do so. At the beginning of labour, owing to the tardy fixation of the breech, the presenting part can with difficulty be reached with the finger. At this stage the point most likely to attract attention is the peculiar way in which the membranes bulge.

When labour is more advanced, the presenting part descends within reach of the finger, and can be recognised (*v.* Fig. 104). It is not at all as easy to distinguish the breech by vaginal examination as is supposed. We can determine the presence of a large, firm, and rounded tumour, not at all unlike a vertex or a face on which a large caput succedaneum has formed. The breech may, however, be distinguished by three bony

points and by the anus. The bony points are the two tubera ischii and the tip of the coccyx, and they are so arranged as to form the apices of an equilateral triangle. The anus can only be mistaken for the mouth. It is distinguished from the latter by the absence of the alveolar ridges and of the tongue, by the peculiar manner in which the sphincter grips the finger if the child is alive, and by the presence of meconium on the finger when withdrawn. If a limb has prolapsed, it will be necessary to distinguish between an elbow and a knee, or a hand and a foot. A knee is easily distinguished from an elbow by its larger size, and by the presence of the tuberosity of the tibia and the patellar ligament. The mobility of the patella is a fallacious sign, as the knee is always flexed when it presents, and so the patella is fixed. The foot can be most easily distinguished from the hand by feeling the heel. In default of it, the phalanges are the best guides; in the foot, the line of the tops of the toes is straight; in the hand, the line of the tops of the fingers is curved. Again, the thumb can be apposed and opposed to the palm; the great toe cannot.

The position of the foetus is ascertained by noting the relation of the different characteristic parts of the breech to one another and to the pelvis (*v.* Fig. 104).

Auscultation.—The heart is heard slightly above the level of the umbilicus, and to one or other side of the middle line.

Mechanism.—The dimensions of the breech are not of any very great importance. They are considerably smaller than the dimensions of the head, and can be reduced still further by compression. The bi-trochanteric diameter is the longest, and measures three and a half inches. The sacro-pubic diameter measures two inches. The mechanism of a breech presentation is

very simple. It engages with the bi-trochanteric diameter in one of the oblique diameters of the brim. As it descends, the anterior buttock usually lies at a slightly lower level than the posterior. The former thus reaches the pelvic floor first, and, as a result, rotates in front and lies under the symphysis (v. Fig. 106). The posterior hip rotates round it, sweeps over



FIG. 105.—Pelvic presentation. The breech advancing through the upper part of the pelvic cavity.

the perinaeum, and is born. If the perinaeum is intact the anterior buttock is born first, but, if the perinaeum is deficient, the posterior may be born first. The rest of the trunk then follows in a similar manner. The attitude of the child is the same as in a vertex presentation; consequently, the feet generally come out close to the breech, and the arms are folded across the chest. The head enters the brim with the chin flexed upon the

chest, and the sub-occipito-bregmatic diameter lying in the opposite oblique diameter of the pelvis to that in which the bi-trochanteric diameter lay. The occiput, as it descends, rotates in front, the chin being still closely applied to the chest, owing to the pressure of the coccyx and perinæum. The occiput now rests behind the pubes, while the face rolls out over the



FIG. 106.—Pelvic presentation. Internal rotation is complete, and the breech is advancing over the perinæum.

perinæum, the chin appearing first, then the mouth, nose, eyes, forehead, and occiput.

Abnormal mechanism.—In a small percentage of cases, the face of the after-coming head may rotate anteriorly instead of posteriorly. It is then rather more difficult to deliver.

Moulding.—In the after-coming head, the fronto-occipital and mento-occipital diameters are diminished, while the cervico-bregmatic and the sub-occipito-

bregmatic diameters are slightly increased (7, Fig. 107). The representative of the caput succedaneum forms on the anterior buttock and the genitals. The scrotum is frequently greatly swollen and may be dark purple or black from capillary ecchymoses.

Treatment.—A pelvic presentation can be treated in one of two ways:—

- (1) It can be turned into a vertex presentation by external version.

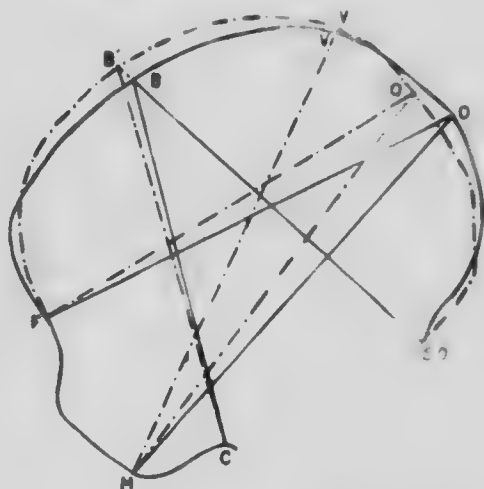


FIG. 107.—Pelvic presentation. The moulding of the fetal head. The dotted outline shows the shape of the moulded after-coming head, the firm outline the shape of the unmoulded head. (*Budin.*)

- (2) It can be left alone, and delivered as a pelvic presentation.

(1) A pelvic presentation is considerably more dangerous for the child than a vertex presentation. It also tends to cause extensive perineal laceration in primiparae owing to the rapidity with which it is necessary to deliver the after-coming head. Con-

sequently, it could appear, at first sight, to be better to turn the child. Before deciding on this, the case must be looked at from another point of view. Pelvic presentation is generally associated with some abnormal condition of either the child or the pelvis; and, in many of these conditions, a pelvic presentation is more favourable for mother or child, or perhaps for both, than a vertex. Therefore we must consider whether version is likely to improve the condition of affairs. These conditions are:—slight degrees of contracted pelvis, hydrocephalic head, or placenta prævia. In the first two, an after-coming head is decidedly less easily than is a head coming first; while, in the third, placenta prævia, where the proper treatment may be to draw down a leg, we have the leg at hand. Before turning a breech presentation into a vertex, then, it is well to exclude these conditions. If none of them is present, the child may be turned, and this course is especially advisable in primiparæ on account of the increased danger of perineal laceration when the pelvic presentation is allowed to persist. The only difficulty is to keep the child in its new position. If the turning is done some time before labour begins, the pelvic presentation will recur. The best time to perform version is when labour has started, but before the breech is fixed, and the membranes have ruptured. Then turn the child by external version (*v.* Chap. XXXII), and apply a bandage to keep it in its place, or rupture the membranes if the os is sufficiently dilated.

If a pelvic presentation is allowed to persist, the treatment of the case is sometimes difficult. There is a general rule for the treatment, during the first stage of labour, of all abnormal presentations, namely, to avoid anything that may increase the liability of the membranes to rupture prematurely. It has been

already explained (*v.* page 68) how it is that premature rupture of the membranes is the rule in these cases, and, in a pelvic presentation especially, the prognosis for the child is worse the earlier the membranes rupture. The indications, then, are to keep the patient in bed during the first stage, to avoid vaginal examination at any rate during a contraction, and not to permit the patient to bear down until after the membranes have ruptured. There is no further special treatment required until the breech appears at the vulva. The patient should then be placed in the dorsal cross-bed position in order to facilitate any manipulations that may be necessary. As the breech slips from behind the perinæum, the attitude of the physician is one of "watchful expectancy." There is little to be done in an ordinary case, except to lift out the feet as they come, in order that they may not catch in the perinæum. It is worse than useless to attempt to express a breech, as we do a head, by pressure from behind the anus, as any attempt merely results in pushing it back into the vagina. Delivery is left to the natural efforts until the child is born as far as the umbilicus, and then a loop of the cord is gently drawn down. There are two reasons for thus drawing down the cord :—

(a) As the body descends, it compresses the cord against the brim of the pelvis. This pressure may be sufficient to prevent the cord descending at the same time as the body. The result of this is, that extreme tension of the cord may occur between the umbilicus of the child and the portion of the cord which is caught at the brim. This tension may be so great as to cause the cord to tear.

(b) If we draw down a loop of the cord and observe its pulsations, we have an exact indication of the condition of the child.

The patient is now on her back, and everything going on favourably, *i. e.* the cord is pulsating. The next uterine contraction should drive the child out all but the head, or perhaps expel it completely. If the head of the child is not expelled by the same contraction which expels the shoulders, then assistance must be rendered, as will be shown afterwards. If we can wait sufficiently long to allow the uterus to expel the body of the child, there is little fear of the arms becoming extended above the head. The uterine contractions acting from behind expel the body, and, at the same time, keep the arms folded across the chest. But in some cases we cannot wait for the uterine contractions, and, when pressure on the fundus has failed, we are obliged to pull upon the body of the child in order to deliver it more rapidly. Then, as a result, the arms are caught at the pelvic brim, and become extended above the head.

The cases in which we cannot wait for the uterus to expel the child are those in which the cord is not pulsating, or only pulsating very feebly, when drawn down. The child is then obviously exposed to the danger of asphyxia, and must be delivered as rapidly as possible. In accomplishing this, the skill and quickness of the obstetrician may be tested to the full, and upon them the life of the child depends. Always remember the great difference that exists between the expulsion of the child by pressure from behind, and the extraction of the child by pulling from below. If the arms become extended, the time necessary for the delivery of the case is increased. Never pull upon the body until you have first tried to express the child by pressing upon the fundus. It is only when this fails that traction is to be made on the body. If this course of action is necessary, seize the child by the pelvis

and draw it downwards as far as possible, while an assistant at the same time presses upon the fundus. The arms usually become extended, and must be brought down before the head can be delivered.

As the child lies in one of the oblique diameters of the pelvis, one arm is posterior and the other anterior. It is better to bring down the posterior arm first, as there is more room for the operator's hand and arm in the hollow of the sacrum, than there is behind the symphysis. To bring the arm down, the body of the child is drawn forwards, towards the mother's abdomen, and as much of the hand as necessary is passed into the vagina, with the palmar surface towards the back of the child. The hand, which naturally corresponds to the side at which the arm lies, is used. The fingers are then slipped upwards along the arm until the elbow is reached (7. Fig. 108). If the forearm is flexed, hook the fingers into the angle of the elbow, and draw it gently downwards over the chest. If the forearm is extended, the fingers must be passed below the elbow and hooked over the extensor surface of the forearm; then, pressure upon the latter causes it to flex, and so to sweep downwards over the face and chest. The posterior arm is thus delivered, and next the anterior arm must be brought down if it is extended. It may be brought down as an anterior arm, or, better, the body may be rotated in such a direction that the anterior shoulder travels in the direction of the back of the child. Rotation is continued until the arm lies posteriorly, and it is then brought down, in a similar manner to the former arm. In some cases an arm may have become so twisted as to lie behind the neck of the child—nuchal position of the arm. If this happens, the arm may be set free by rotating the body; but, if rotation is impos-

sible, the arm may have to be fractured before it can be brought down.

Great care must be taken in bringing down the arms to avoid fracturing the humerus or clavicle. The former is most usually broken by attempting to bring the arm down with the fingers upon the middle of the humerus, instead of below the elbow. The clavicle sometimes breaks, when we imagine we are doing

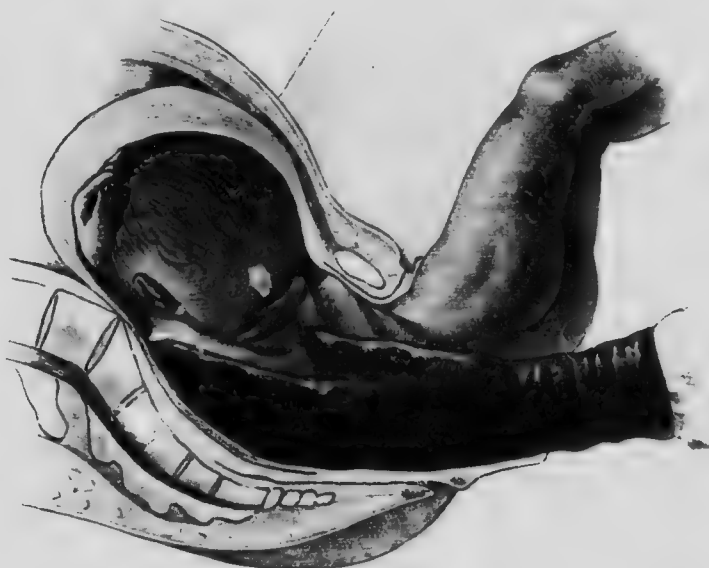


FIG. 108.—Pelvic presentation. The mode of bringing down the posterior arm.

everything correctly. The fracture is probably caused by the head of the humerus, as it rotates, being pressed inwards by the pelvic brim, and so tending to make the ends of the clavicle approximate one another.

As soon as the shoulders are born, the delivery of the head must follow as rapidly as possible. It is not alone in cases in which traction on the trunk of the

child has been made, that the head requires to be delivered artificially. Whenever the head is not expelled by the same contraction that expels the shoulders, it will require assistance. The reason of this is manifest. When the shoulders are born, the head has left the uterus and is lying in the vagina; accordingly, the uterine contractions have no power to expel it. The head must never be allowed to remain in the vagina for a moment longer than is necessary. The cold air chilling the body of the child, and the beginning asphyxia, cause premature attempts at inspiration, and mucus and meconium are sucked into the lungs. Further, if the cord has not been compressed up to this point, it is now certainly compressed by the head. And, lastly, as the fœtus has left the uterus, the placenta is very probably in process of being detached.

There are three good methods of delivering the after-coming head:—

- (A) A modification of the Prague method.
- (B) Martin's method.
- (C) Smellie's method.*

Before describing them we must insist on one point. The head must be brought into a position of flexion before any attempt at extraction.

(A) **A Modification of the Prague Method.**—This is the quickest and simplest method of delivering the head, if it is in the pelvis; it is of little value when the head is above the brim. Standing at the patient's right side, the fingers of the left hand are hooked over the shoulders, and the feet are seized in the right hand (*v.* Fig. 109). The shoulders of the child are drawn directly upwards by the left hand, and detained in this position throughout the extraction; by this means the

* This method—usually known as the Veit-Smellie method—is described in full by Smellie in his 'Midwifery,' part iii, case 303.

pressure of the symphysis upon the occiput causes flexion of the head. With the right hand, the body of the child is then swept forwards and upwards over the mother's abdomen, and the head, rotating round the point of the occiput which is fixed beneath the symphysis, is born.

(B) **Martin's Method.**—This method is suitable for all cases, whether the head is above or below the brim. With the patient in the cross-bed position, the obstetri-

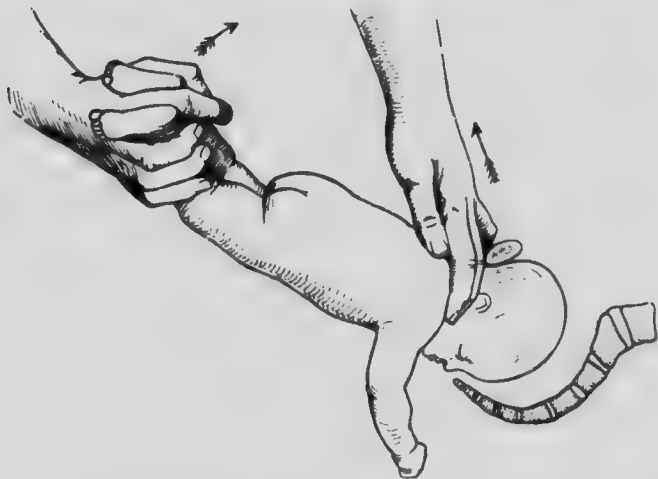


FIG. 109.—Pelvic presentation. A modification of the Prague method of delivering the after-coming head.

cian, standing in front of her, places the arm corresponding to the side towards which the face of the fœtus is turned, *i. e.* the right arm when the face is on the left and *vice versa*, beneath the body of the fœtus, so that the latter lies straddle-wise upon it. As much as is required of the hand is then introduced into the vagina, the mouth is found, and two fingers introduced as far back as possible. This last precaution is necessary in order to avoid fracture of the jaw. The head

is so guided by the fingers in the mouth that its antero-posterior diameter lies in the oblique diameter of the pelvis, or, in the case of a flat pelvis, in the transverse, and at the same time it is pulled down into a position of flexion. The other hand is then placed on the fundus, and, by means of pressure on the occiput in such a manner as to cause flexion, the child is delivered (*v.* Fig. 110).

(c) **Smellie's Method.**—This is also suitable for any case, and is the most powerful method for extracting

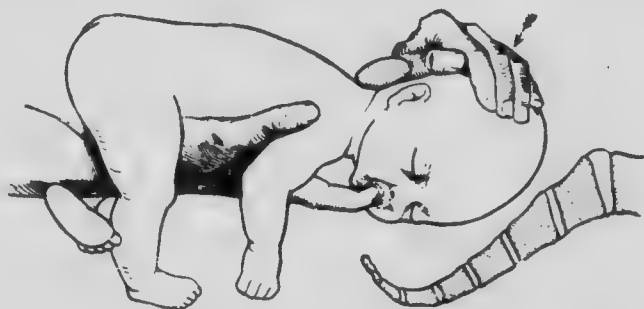


FIG 110.—Pelvic presentation. Martin's method of delivering the after-coming head.

the head which we have at our disposal. The fingers of one hand are introduced into the mouth as in Martin's method, whilst the fingers of the other hand are placed over the shoulders as in the Prague method. Flexion is obtained by jaw traction; whilst, to deliver, traction is applied both on the shoulders and the jaw. If the head is above the brim, we must first pull backwards and downwards, *i.e.* in the axis of the brim; then directly downwards; and then forwards, at the same time carrying the body of the child as it lies on the arm upwards over the mother's abdomen (*v.* Fig. 111).

The application of the forceps to the after-coming head only deserves a passing mention. It will without doubt extract the head, but it requires time for application, it is not always ready, and no more power can be obtained by it than by Martin's or Smellie's method. Consequently, it is better to accustom ourselves to the simplest method. If the forceps is used, it is locked



FIG. 111.—Pelvic presentation. Smellie's method of delivering the after-coming head. (*Faraboeuf*).

under the body of the child, and traction applied in the axis of the pelvis.

If the face rotates anteriorly, there are two ways of delivering the head; the first is the better method for those cases in which the face of the child is lying behind the symphysis, *i. e.* in the pelvic cavity. To perform it, carry the body of the child well backwards. By this means the chin is drawn down from behind the symphysis. If the face does not follow easily, introduce the fingers into the mouth and apply traction, so that the face rolls out from behind the symphysis, the forehead

following, and lastly the occiput. The other method is just the reverse of this, and is more suited to those cases in which the chin catches above the symphysis. The body of the child is carried well forwards so that the occiput rolls out over the perinæum, the forehead following, and lastly the face.

Prognosis.—The mortality as far as the mother is concerned is no worse than in a vertex presentation; the foetal mortality is, however, considerably higher. It is given variously as one in four and one in eleven. The longer the membranes remain intact, the better will the os be dilated, and the quicker will be the passage of the head through the pelvis.

CHAPTER XII.

TRANSVERSE PRESENTATION.

Frequency — *Ætiology* — Positions — Diagnosis — Mechanism ; Spontaneous Version, Spontaneous Evolution, *Corpore Conducato* — Treatment.

TRANSVERSE presentation, cross-birth, and oblique presentation, are the different terms applied to the presentation of the fœtus, when it lies in the uterus in such a manner that neither pole presents (*v.* Fig. 113). Strictly speaking, a transverse presentation only occurs when the fœtus lies with its head at one side of the uterus, and its breech directly opposite. Similarly, an oblique presentation occurs when the fœtal head or breech lies in one hypochondrium, the other pole being in the opposite iliac fossa.

Frequency.—The relative frequency of transverse presentation is very variously stated by different writers. In these countries it is said to occur about once in 243 labours. At the Rotunda Hospital the relative frequency of transverse presentation amongst 35,000 cases of immature, premature, and full term labour was one in 303·4, *i. e.* 0·33 per cent.

Ætiology.—Any condition, which causes a variation from the normal shape of the uterus or pelvis, favours a transverse presentation. The principal of these conditions are :—contracted pelvis ; large lax uterus ; hydramnios ; twins ; placenta prævia ; and tumours of

the uterus, as *myomata*. Abnormalities in the shape or size of the child, will also favour a transverse presentation, e.g.:—a very large fetus; a very small or premature fetus; tumours on the body of the child; and double monsters,

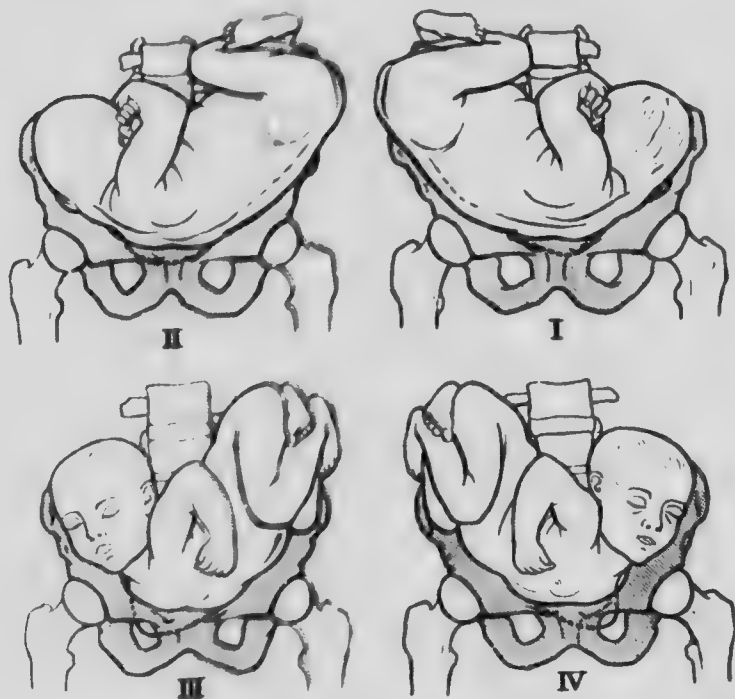


FIG. 112.—The four positions in which the fetus may lie in shoulder presentation.

Positions.—Four positions are recognised :—

- 1st position—back in front, head to the left.
- 2nd position—back in front, head to the right.
- 3rd position—back behind, head to the right.
- 4th position—back behind, head to the left.

The first and second positions are the most common.

Diagnosis.—**Abdominal Palpation.**—A transverse presentation can readily be diagnosed by this means. At the beginning of labour the pelvic brim is found to be empty ; the head is felt at one side of the abdomen, the breech at the opposite, and the back running between the two.



FIG. 113.—Transverse presentation. Fœtus in the second position.

The position of the fœtus is ascertained by noting whether the back is turned forwards or backwards, and the head to the left or the right.

Vaginal Examination.—The presenting part cannot be felt at first. The membranes protrude unduly into the vagina during a contraction. If the case has become a so-called neglected shoulder presentation, the shoulder can be felt, a few of the ribs, and the arm prolapsed into the vagina (*v.* Fig. 114). The arm is

recognised as already mentioned (v. page 65). To decide whether it is the right or left one, imagine yourself shaking hands with it. If your hand lies palm to



FIG. 114.—Transverse presentation. So-called neglected shoulder presentation.

palm with it with the thumbs together, it is the right or left, according as the hand you are examining with is right or left. It must not be forgotten that, although in a neglected transverse presentation the shoulder is practically always driven down into the pelvis, still at

the beginning of labour other parts of the body of the

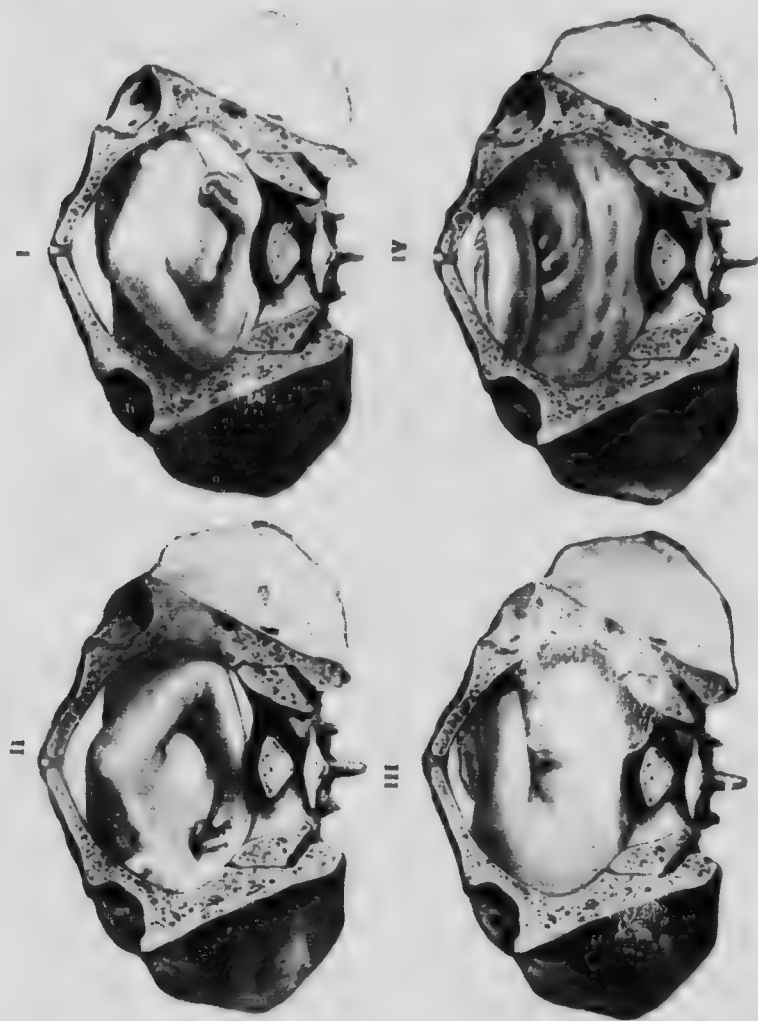


FIG. 115.—The four positions of the foetal trunk in transverse presentation, as felt from below.

foetus may present. The middle of the back may lie lowest, or a foot and a hand may come down together.

The position of the foetus is ascertained by noting the side of the pelvis at which the presenting shoulder lies and whether the back is turned forwards or backwards.

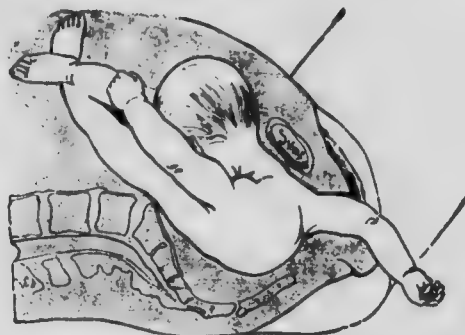


FIG. 116.—Transverse presentation. Spontaneous evolution, first stage. (Norris.)

Mechanism.—Transverse presentation, like brow presentation, must never be allowed to remain unchanged, except, perhaps, in the case of very small or macerated

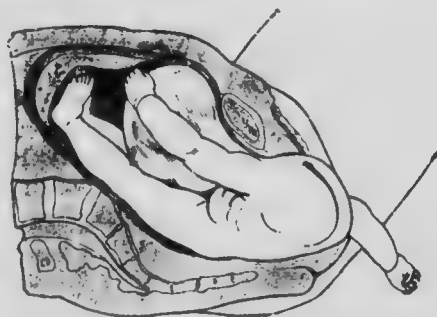


FIG. 117.—Transverse presentation. Spontaneous evolution, second stage. (Norris.)

infants. Such infants can sometimes be delivered by the natural efforts in one of three ways:—

- (1) By spontaneous version.
- (2) By spontaneous evolution.
- (3) *Corpore conduplicato*.

(1) *Spontaneous version* occurs when the presenting shoulder is pushed away from the os by strong uterine contractions, and the head or the breech takes its place. Delivery is then usually rapid.

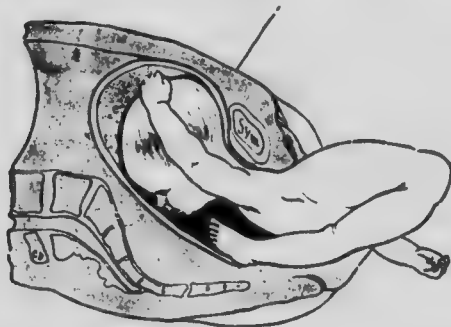


FIG. 118.—Transverse presentation. Spontaneous evolution third stage. (Norris.)

(2) *Spontaneous evolution* occurs as follows:—The shoulder of the child is driven down into the pelvis, and the corresponding arm prolapses out of the vagina. The shoulder then becomes fixed under the symphysis,

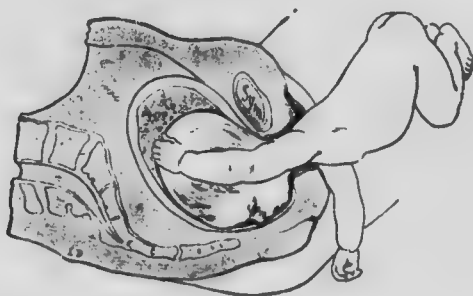


FIG. 119.—Transverse presentation. Spontaneous evolution, final stage. (Norris.)

while the back, acutely flexed, gradually appears from above the perinæum. The breech follows, and the lower limbs; the last part to be born is the head and remaining arm (*v.* Figs. 116 to 119).

(3) Expulsion *corpore conduplicato* is an extremely rare occurrence, and is only possible in the case of a very premature foetus, or of one which is in an advanced condition of maceration. The shoulder which presents is driven down into the pelvis, closely followed by the

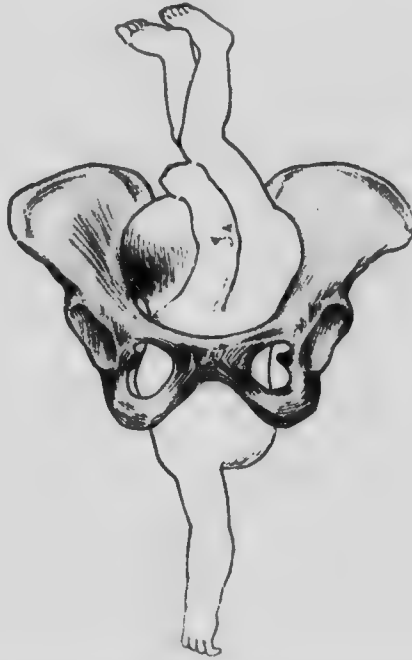


FIG. 120.—Transverse presentation. Birth *corpore conduplicato*.
(Küstner.)

head and the rest of the trunk ; the head and chest thus descending together (*v.* Fig. 120).

Treatment.—A cross-birth must be treated in one of four ways :—

- (1) Postural treatment.
- (2) External cephalic version.
- (3) Internal or bi-polar podalic version.
- 4) Embryotomy.

1. Postural treatment is often sufficient in cases of

slight obliquity of the fœtus. To be of service, the membranes must be unruptured, and a limb must not be prolapsed through the os. We must first understand the reasons on which the method is based. When the patient lies upon her side, the fundus of the uterus falls over to that side under the influence of gravitation, carrying with it whatever pole of the fœtus it contains, and so causing a corresponding elevation of the opposite pole. Accordingly, if the head is in one iliac fossa and the patient lies on that side, the breech will fall towards that side, and the head will rise towards the opposite side.

(2) External cephalic version requires similar conditions to the previous method. It is to be used when the obliquity of the fœtus is too great to be corrected by postural treatment. It will not always be successful, as the child tends to slip back into its original position. It should, however, always be given a trial, if the case is seen in time, as if successful, it gives the child a better chance of life. It is useless to attempt this form of version until the patient is in labour, as, otherwise, the head would not fix, and the malpresentation would recur. The child is turned by external version until the head comes over the brim; the membranes are then ruptured and the head held there until it is fixed, or a tight binder is applied to keep it in its place (*v.* Chap. XXXIII).

(3) Internal podalic version, unless directly contra-indicated through fear of causing rupture of the uterus, must be adopted whenever external cephalic version has failed, or when the necessary conditions for performing it are not present. Any form of version is contra-indicated in neglected shoulder presentation when a considerable portion of the child has been expelled from the uterus, or when the contraction ring

is more than $2\frac{1}{2}$ inches above the symphysis (Winckel). Version may also be impossible to perform, owing to the force with which the child has been driven into the pelvis. After the leg of the child has been drawn down into the vagina, it is well to leave its further expulsion to the natural efforts, unless there is an indication for immediate delivery (for the methods of performing version, *v.* Chap. XXXIII).

(4) Embryotomy is indicated in a neglected shoulder presentation:—

- (a) When podalic version is contra-indicated owing to the condition of the uterus.
- (b) When podalic version is impossible.
- (c) When podalic version is difficult and the child is dead.

Decapitation is the best mode of procedure. If the neck cannot be reached, evisceration must be performed (*v.* Chap. XXXIV).

We may sum up the treatment of transverse presentation in a few words. If the case is seen early in labour, and there is only a slight obliquity of the foetus, try postural treatment. If this fails, perform external cephalic version, unless some complication, such as contracted pelvis, calls for a pelvic presentation, in which case perform podalic version. If the case is not seen until after the membranes have ruptured, perform internal podalic version, unless the condition of the uterus forbids it, in which case decapitation or evisceration must be performed.

Prognosis.—The foetal mortality is very high. About 33 per cent. of children alive at the beginning of labour are born dead. The maternal mortality is said to be about 5.5 per cent. (Winckel.)

CHAPTER XIII.

MULTIPLE PREGNANCY.

Varieties—Frequency—Twin Pregnancy—Ætiology—Diagnosis—Presentations—Course of Labour—Treatment—Prognosis—Complications : Locked Twins, Entangling of the Cords, Fœtus Papyraceus.

MULTIPLE pregnancy is the term applied to the presence of two or more children in the uterus.

Twin pregnancy may occur in three ways. One ovum may contain two nuclei both of which become fertilised, two separate ova may become fertilised, or a single germinative area may divide into two embryos. In the first case, there is but one placenta and one chorion, but there are two amnions. In the second case, the children may or may not be of the same sex, there are two placentæ, two chorions, and two amnions. In the third case, there will be a common placenta, chorion, and amnion. It must not be forgotten that two placentæ may grow in such a position that their edges coalesce, and so there may appear to be but one placenta. The nature of these cases is shown by the fact that there are two chorions.

Frequency.—Twins occur, approximately, once in 88 births, triplets once in 7820, quadruplets once in 366,012; quintuple births and sextlets have been recorded. At the Rotunda Hospital amongst 35,000 cases of labour, the relative frequency of twins was one

in 72'89, *i.e.* 1'38 per cent., and of triplets one in 7099'6, *i.e.* 0'01 per cent.



FIG. 121.—Twin pregnancy.

Diagnosis.—The only certain way to diagnose twins

is for two observers to count the foetal hearts at the same time, and to find that their results do not correspond. If monsters are excluded, twins can also be diagnosed by palpating two heads, two backs, more than two large parts (*viz.* a head or breech), and more than four limbs.

Presentations.—Abnormal presentations are relatively more common in multiple than in single pregnancies. The following table shows the relative frequency of the different presentations :—

| | | | |
|--|---|-------|---|
| Two head presentations occur in 49.00 per cent. of twin pregnancies. | | | |
| A head and a breech | " | 31.70 | " |
| Two breeches | " | 8.60 | " |
| A head and a transverse | " | 6.18 | " |
| A breech and a transverse | " | 4.04 | " |
| Two transverse | " | 0.35 | " |

(*Spiegelberg.*)

The usual course of labour is, that after the birth of the first child comes the second child, then the placenta of the first child, and then the placenta of the second child. In a small proportion of cases the first child is followed immediately by its placenta, and then comes the second child and its placenta.

Treatment.—Having diagnosed the presentation of the first child there is nothing further to be done but to allow it to be born naturally. Then palpate the presentation of the second child, as the latter may lie transversely. If so, correct the presentation. Rupture the membranes of the second child about thirty minutes after the birth of the first, if they have not already burst spontaneously. This is always necessary, otherwise the second child might be retained in the uterus for some hours or even some days. Twins are frequently premature, and when the over-distended uterus has been relieved, by the birth of one child, it may lose its

irritability. Cases have been recorded in which the second twin has been retained for a fortnight, or even more, after the birth of the first. Indeed, some writers have advised, when the placenta of the first child follows it, to put on a binder and keep the patient quiet, in the hope that the second child may not be born until full term. This treatment, however, exposes the woman to all the pain and expense of a second confinement, and, save under very exceptional circumstances, does not appear to be justifiable. The object of waiting for thirty minutes after the birth of the first child, before rupturing the membranes, is to give the uterus a temporary rest, and so to lessen the danger of atonic post-partum hæmorrhage.

Prognosis.—The prognosis in twin pregnancy is little worse, for the mother, than in a single pregnancy. For the children, the prognosis differs according to the presentation. But, as the children are usually small, and the maternal parts, at any rate for the second child, are well dilated, the mortality is less than the same abnormal presentation would cause in a single pregnancy. Many twins, though born alive, die during the first month of their existence, as a result of their premature birth.

Complications.—Dystocia, *i.e.* difficult labour, may arise in twin pregnancy owing to the children becoming interlocked during birth. This is very uncommon, but it may occur in three ways:—

(1) Two very small heads enter the pelvis at the same moment; rotation is thus prevented, and further delivery without assistance is impossible. The treatment consists in endeavouring to push up one head, so as to allow the other to descend. If the latter does not descend, the forceps must be applied. In very rare cases perforation may be necessary.

(2) Both children present by the head, one a little in advance of the other. The head of the second child is driven down against the neck of the first, and so prevents any further descent. In such case, the head of the second must be pushed up, and the first extracted by forceps.

(3) The first child presents by the breech, and is partially born. The second child presenting by the head enters the pelvis in such a manner that its chin becomes locked under the chin of the after-coming head of the first child. In such cases, if the second head cannot be pushed up, an attempt may be made to extract it with forceps past the body of the first child. If this fails, or if the first child is dead, the latter should be decapitated, its head pushed up, and the second child expressed or extracted by the forceps. In any of these cases in which decapitation or perforation is necessary, the first child should be selected for operation, as it is most probably dead.

Entangling of the cords sometimes happens in multiple pregnancy. As a result, one or both children may die *in utero*. Also, during the birth of the first child, the cord of the second may be pulled down into a sharp angle, and circulation through it thereby prevented. Lest this accident should happen, the cord of the first child should never be pulled upon.

A *fœtus papyraceus* is formed when one child dies in the uterus, but the other lives. As no bacteria gain access to the dead child it does not putrefy, but shrivels up and becomes mummified. The growing child then presses against it, and flattens it out against the uterine wall; and it is found, after birth, adherent to the membranes.

CHAPTER XIV.

THE PUERPERIUM.

Physiological Phenomena—The Involution of the Uterus—The Lochia—Varieties, Amount—Lactation: Amount, Composition of Milk—Prognosis—Treatment—Complications: Sub-involution.

THE puerperium is the term applied to the period during which the woman is recovering from the effects of pregnancy and childbirth. During the puerperium the parturient canal is returning to its normal condition, and lactation is being established.

Phenomena.—There are certain phenomena to be considered which are peculiar to this period. These are:—

- (A) The involution of the uterus.
- (B) The lochial discharges.
- (C) The establishment of lactation.

A) *Involution.*—The uterus takes six weeks to return to its normal non-impregnated condition. Immediately after delivery it weighs from 24 to 48 ounces, and this has to be reduced to the normal weight of 9 to 10 drachms (Heschl). This process of involution is caused chiefly by the diminution that occurs in the blood-supply of the uterus after delivery. The uterus, contracting tightly, compresses and obliterates the greater number of its nutrient vessels. The enlarged muscle-fibres were formerly said to undergo a fatty degeneration, and to come away in the lochia as

fat droplets. This explanation, however, has been almost universally abandoned, and, instead, three other explanations have been offered. The first of these is that the fibres are absorbed and carried away in the lymphatic circulation, their place being taken by smaller fibres, similar to the original fibres of the non-impregnated uterus. The second, offered by Helme, is that the process of involution is one of atrophy, which results in a diminution in bulk of each fibre, probably by a process of solution, and that there is no new formation of smaller fibres. The third explanation, offered by Sanger, is that the changes in the fibres are due to a hyaline and finely granular degeneration, and that the products of degeneration are oxidised in the uterus and do not find their way into the maternal blood. As the muscle-fibres undergo involution, the remains of the decidua disappear, and the normal mucous membrane is re-formed. This process is complete at or shortly before the eighth week after delivery.

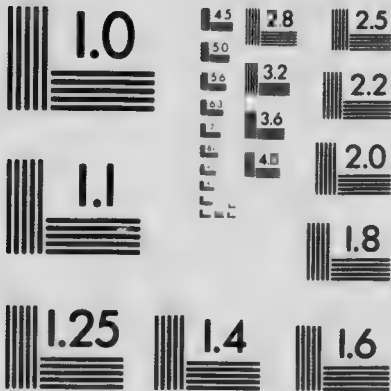
As the uterus undergoes involution, it decreases in size. At the fourth day, the fundus should be just below the level of the umbilicus, by the tenth day it should lie behind the symphysis, the posterior surface of the body occupying the plane of the brim, and, by the fifteenth day, the uterus should be entirely a pelvic organ (Webster).

(B) **The Lochia.**—The lochia are the term applied to the discharge which comes away during involution of the uterus. In a normal case, in which there is no bacterial infection of the vagina, this discharge is akin in character to the discharge from an aseptic granulating surface, and consists at first of blood with leucocytes in excess, then blood and serum, and finally serum alone. Blood should have disappeared by the sixth day. Mingled with the discharge are found fragments of decidua



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and membranes, the products of fatty degeneration of the decidual tissue, and mucus from the cervical glands. If care has been taken to maintain the aseptic condition of the vagina, bacteria will be absent; otherwise saprophytic and pyogenic bacteria will be found. The average amount of lochia under normal circumstances is about eleven ounces, and the average duration of the discharge is about eight days (Giles). The quantity is said to vary directly with the weight of the child, the size of the placenta, and the usual amount of the menstrual flow, and inversely with the amount of blood lost during labour. The normal odour of lochia is that of the blood it contains, and any putrid or fœtid odour is pathological.

(c) **Lactation.**—The fluid which is found in the breast during the first forty-eight hours after delivery is termed *colostrum*. The milk proper becomes established about the evening of the second, or the morning of the third day, and rapidly increases in amount. The quantity of milk which a woman secretes, and the rate of increase during the first seven days, are as follows:—

| | | | | | | | |
|----------------------------|---|----|---|----|----|----|-----|
| Day | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Amount in ounces | 0 | 3½ | 7 | 8½ | 13 | 15 | 17½ |

(Winckel.)

The average daily quantity of milk secreted at different periods of lactation is as follows:—

| | |
|---------------------------------|-----------------|
| At end of 1st week | 10 to 16 ounces |
| During 2nd " | 13 " 18 " |
| " 3rd " | 14 " 24 " |
| " 4th " | 16 " 26 " |
| From 5th to 13th week | 20 " 34 " |
| " 4th " 6th month | 24 " 38 " |
| " 6th " 9th " | 30 " 40 " |

(Holt.)

Tables showing the average composition of colostrum and of human milk will be found in the chapter on infant feeding (*v.* Chap. XXXV).

Prognosis.—We can tell whether or not the patient is progressing favourably during the puerperium, by inquiring into certain points. They are as follows:—

(A) **Aspect.**—The aspect of the patient is of the greatest importance. If her condition is satisfactory, there should be no change from what it is under ordinary circumstances. In most septic conditions, her face becomes drawn and pinched, and has a yellow tinge; the angles of the nostrils are drawn down; and the whole appearance is altered.

(B) **Sleep.**—The amount of sleep the patient obtains is also a most important index to her condition. Sleeplessness is often one of the first indications of beginning sepsis; and, on the contrary, if the patient sleeps well, she generally is progressing favourably.

(C) **Temperature.**—Slight variations of temperature are very common during the puerperium, so that any temperature which remains below 100° F. (37.7° C.) in the axilla may usually be considered as normal. Any rise above that points to some abnormal condition.

(D) **Pulse.**—The pulse ranges between 50 and 90 beats per minute, and usually averages from 60 to 70. It is often a most important aid in the diagnosis of sepsis. If the temperature rises, but the pulse remains tolerably normal, the condition in all probability is not serious.

(E) **Milk.**—The milk should flow freely, after the second day; its sudden cessation points to septic infection.

(F) **The Lochial Discharges.**—Normal lochia should flow freely at first, and cease gradually. Sudden stoppage sometimes corresponds with the onset of

sepsis. The colour should change according to the day of confinement, as has been already mentioned. If the lochia are sanguineous after the sixth day, it shows that some degree of sub-involution is present. Any putrid odour is pathological. The stain on the napkin caused by healthy lochia differs considerably from the stain caused by putrid lochia. The former is red in the centre and fades away towards the edge, which is colourless. The latter is not so red in the centre, but becomes of a deeper red towards the edge, which is clearly defined.

The relative value of these points is well brought out in the following words :—"If a patient with a high temperature looks well, sleeps well, and says she is well, she is at any rate not acutely septic." "If a patient with a high temperature looks very ill, sleeps very badly, and says she feels very ill, she generally is very ill." "If a patient with a high temperature looks very ill, sleeps very badly, but says she is very well, she will probably die" (Smyly). The last condition is known as *euphoria*, and will be described under acute sepsis (v. page 478).

Treatment.—The treatment of the patient during the puerperium, is best considered under certain headings :—

(A) **Rest.**—As soon as the patient has been delivered and comfortably settled, she should be kept perfectly quiet, and allowed to sleep if she can. During the first few days, she will probably spend the greater part of her time in this manner. It is usually considered that she should be kept in bed until at least the seventh day, and, if possible, until the tenth or twelfth. Many obstetricians hold that early sitting up in bed and even getting out of bed for a short time daily is advantageous, as it promotes uterine drainage. At the

Rotunda Hospital for the past year we have allowed patients to leave bed once during the second twenty-four hours after delivery. After forty-eight hours we allow them to leave bed at least twice in the twenty-four hours, provided that their general condition is in all ways satisfactory. After seventy-two hours, they are allowed to take a few steps when they get up, or to sit for a few minutes in a chair, the time they remain up being gradually increased so long as the general health of the patient continues satisfactory. We have found that the patients are the better for this, and that the morbidity rate due to sapræmic intoxication is less.

(B) **Diet.**—For the first two days the patient is kept on light nutritious food ;—beef-tea, gruel, milk, tea and toast, and egg well beaten up,—anything of this nature may be given. After this, the diet is more liberal, and, if her bowels have moved, she may have any ordinary digestible food. Stimulants are not necessary unless the patient is very weak. If she is in the habit of taking them regularly, it may be advisable to continue them.

(C) **Bladder.**—The bladder should be emptied within six hours after the confinement. It is occasionally impossible to get the patient to pass water, as the recumbent position, and the presence of slight lacerations and bruises about the urethra, combine to prevent her. If the patient cannot pass water in the recumbent position, even after hot stupes and pressure over the bladder have been tried, she should turn on her hands and knees, and try to do so in this position ; or she may sit up if there is no perinæal laceration. If, as a last resource, the catheter must be passed, the vulva must be thoroughly washed, the urethra exposed, and the catheter passed by vision, not by touch. Only a metal or glass catheter should be used, on account of the

difficulty of sterilising other forms. There is no great risk in passing a catheter on the first or second day after confinement, but after this the risk is greatly increased. The lochia then contain bacteria, and if they are carried into the bladder, a severe cystitis may start.

(D) **Bowels.**—The usually accepted idea is that the patient should not get a purgative until the third day. Most patients are, however, much relieved by, and considerably the better for, a purgative on the evening of the second day. Castor oil (3j—3ij), liquid extract of cascara sagrada (3j—3ij), or sulphate of magnesium (3ss) may be given. An aperient should be administered every second day during the puerperium, if the bowels do not move of themselves.

(E) **The Vulva.**—The importance of maintaining the asepsis of the vulva, subsequent to delivery, has been already mentioned (*cf.* page 5), and the remarks then made may be regarded as applying to the entire puerperium. The best method of maintaining the asepsis of the vagina consists in keeping the vulva covered by a sterilised pad of cotton-wool, or by a sanitary towel soaked in an antiseptic such as biniodide of mercury, and this pad covered in turn by a layer of absorbent wool. These pads must be changed as often as the lochia soak through the outer covering; and this, during the first couple of days, will usually occur every two or three hours. Subsequently, it will be sufficient to change them every six or even every twelve hours. If it is improbable that the patient will receive careful nursing, it is better to avoid the use of any pad over the vulva, as it is preferable that the lochia should escape freely on to a draw-sheet than that they should be allowed to remain in contact with the vulva after decomposition has begun. Whenever a pad is changed,

the labia should be separated and the vulva and vaginal orifice washed with a warm antiseptic lotion, but vaginal or uterine douching is contra-indicated in a normal case.

Finally, we urge the advisability of examining the patient bi-manually about a fortnight or three weeks after delivery. Such an examination is a most proper and necessary precaution. Even in cases in which the puerperium has been apparently normal, backward displacement of the uterus may occur. If this displacement is corrected, and is kept corrected by a suitable pessary, as a rule no evil effects will follow, and it will be possible to remove the pessary in three or four weeks. If, on the other hand, the displacement is allowed to persist, a condition of chronic backward displacement will probably result, and will be the more difficult to cure in proportion to the length of time for which it is left unrelieved. If, on making an examination, a displacement is found, the uterus must be replaced, a suitably sized Smith-Hodge pessary inserted, and the patient again examined in a day or two to see if the uterus remains in a normal position. The pessary may, as a rule, be removed in three or four weeks. If the uterus then remains in a normal position, the need for the pessary is over. If, on the other hand, the uterus again falls back, the pessary must be replaced.

Complications.—The complications to be feared during the puerperium are :—hæmorrhage, sepsis, and sub-involution. Each of these will be discussed later.

CHAPTER XV.

THE DISORDERS OF PREGNANCY.

Morning Sickness—Nervous Gravidarum—Constipation—Retention of Urine—Incontinence of Urine—Anæmia—Hydræmia—Varicose Veins—Hæmorrhoids—Salivation—Pyrosis—Pruritus Vulvæ—Neuralgia.

MORNING SICKNESS.

THE commonest of the disorders of pregnancy is, perhaps, the nausea or vomiting of the early months, the so-called morning sickness.

Ætiology.—Morning sickness is said to be reflex in origin, and is probably due to the hypersensitive condition of the patient, a condition which renders her prone to have her mental or physical equilibrium upset by slighter causes than would be the case if she were not pregnant.

Symptoms.—The severity of morning sickness varies very much in different persons. In some it is little more than a slight sense of nausea, whilst in other cases—happily rare—it may reach such a pitch that the gravest result is to be apprehended. It is then known as hyperemesis, and is one of the severest diseases of pregnancy.

Treatment.—In its mild form, morning sickness requires little treatment; the regulation of the bowels is generally sufficient. A teacup of very hot water the

first thing on awaking, or a light breakfast in bed at 7.30 a.m. or 8.0 a.m., consisting of a cup of tea and a small piece of dry toast, will usually overcome any tendency to vomit. If this is not enough, the administration of bicarbonate of soda, subnitrate of bismuth, aromatic spirits of ammonia, or of a pill containing one-quarter of a grain each of calomel and of ipecacuanha may be tried. Sips, or sometimes large draughts of hot water, or an effervescing mixture containing hydrocyanic acid, may be found of considerable value.

NEPHRITIS GRAVIDARUM.

Nephritis gravidarum is the term applied to disease of the kidneys occurring during pregnancy. The kidneys may be affected in four different ways (Dührssen):—

- (A) The kidney of pregnancy.
- (B) The relapsing kidney of pregnancy.
- (C) True nephritis arising during pregnancy.
- (D) Chronic nephritis.

(A) **The Kidney of Pregnancy.**—The pathological condition in the kidney of pregnancy is a cloudy swelling and fatty change of the epithelium, due to an anæmia, which in turn is said to be caused by spasm of the renal arteries produced by reflex stimuli from the genital tract (Dührssen). This infiltration of the epithelium permits the passage of albumen and interferes with the secretion of urine. In severe cases it may even cause total suppression of urine. Renal anæmia has also been attributed to the blocking of the renal nutrient vessels by emboli caused by the action of some coagulation-producing ferment on the blood (Volhard).

Symptoms.—The first symptoms usually appear in the later months of pregnancy, and consist in the

occurrence of headache, vomiting, and œdema of the extremities, face, and body. The urine diminishes in quantity and contains much albumin, tube-casts, renal epithelium, and a few blood-corpuscles.

Treatment.—This condition of the kidney very commonly is associated with eclampsia, and its treatment will be described in the chapter on "Eclampsia" (v. page 308). The kidney as a rule returns to its normal condition after pregnancy is over, but, on the other hand, true chronic nephritis may result.

(B) **The Relapsing Kidney of Pregnancy.**—This is the term applied to that condition of the kidney in which albumin and casts are found in the urine early in pregnancy, disappear after delivery, and return with each subsequent pregnancy. The foetus usually dies from degeneration of the placenta and is expelled. Eclampsia is of rare occurrence.

Treatment.—The treatment is similar to that of the pregnancy kidney.

(C) & (D) **True Nephritis occurring during Pregnancy, and Chronic Nephritis.**—These two conditions only differ in that the former includes cases of acute or chronic nephritis beginning during pregnancy, the latter cases of chronic nephritis in the course of which pregnancy has occurred.

Symptoms.—Both these conditions cause albuminuria, casts, and diminution of urine. They do not tend to cause eclampsia, but favour the death of the foetus, the premature detachment of the placenta, the occurrence of retinitis, and cerebral hæmorrhage. Chronic nephritis existing previous to pregnancy is greatly aggravated by the pregnancy. Cardiac hypertrophy is usually marked, and, in advanced cases, the secondary results of a failing heart appear.

Treatment.—The treatment is at first similar to that

of pregnancy kidney (v. page 308). In severe cases, as shown by the occurrence of retinal hæmorrhage, rigors, diminished secretion of urine, threatened cardiac failure, it will be necessary to induce premature labour. If the patient does not come for treatment until she has reached the stage at which the kidneys or the heart have almost completely failed, it is not advisable to induce labour until every attempt has been made to restore their action, as the shock of labour may cause death. If, on the other hand, the condition of the patient is first improved, labour may then be induced.

CONSTIPATION.

Constipation is a very common occurrence, and, if allowed to persist, may lead to far-reaching ill results to both mother and fœtus. The regular action of the bowels is of importance at all times, but during pregnancy it is even more so, as the waste products of both the mother and the fœtus have then to be eliminated through the maternal system, and as the proper working of the other eliminatory organs is largely dependent upon that of the bowels. Pyrosis and flatulency are frequently associated with constipation.

Treatment.—One should always try to relieve constipation by alterations in the patient's dietary and general mode of life, rather than by the administration of drugs. If, however, it is found to be impossible to regulate the bowels by such means, laxatives must be given, or enemata, and, as a last resource, purgatives. The dietetic treatment of constipation consists chiefly in the use of such foods as leave in the intestine a considerable amount of undigested residue which, by its presence, causes a mechanical irritation of the intestinal

mucous membrane. Such foods are green vegetables, wholemeal bread, stewed dry fruits or ripe fruits, salads, and fresh fruit jams and preserves. A common cause of constipation during pregnancy is an insufficient consumption of fluid, leading to a diminution in the fluid part of the intestinal secretions and a consequent dryness of the intestinal contents. In order to counteract this, the free consumption of fluid, especially water, is advisable.

If a laxative is required, perhaps the best form in which to administer it is as one of the natural saline mineral waters, such as Apenta, or Hunyadi Janos. Either of these may be given as a routine every morning on an empty stomach, in quantities of half a wine-glass to half a tumbler. If this is not sufficient, a soap-and-water enema may be given when necessary. Other laxatives which may be found of value in particular cases are tamar indien, small doses of castor oil (3j to 3iij), sulphate of magnesium ($3\frac{1}{4}$ to 5j), cascara sagrada (3ss of the liquid extract), calomel (gr. ss to gr. j repeated), aloin (gr. $\frac{1}{2}$), and compound liquorice-powder (3ss). If such doses are not sufficient the drugs must be given in purgative doses.

RETENTION OF URINE.

Retention of urine is a serious, but uncommon occurrence during pregnancy.

Etiology.—It rarely occurs unless a displacement of either the uterus or vagina interferes with the normal condition of the neck of the bladder or of the urethra. The two conditions, which most commonly do this, are retro-deviation of the uterus and prolapse of the uterus or of the anterior vaginal wall (*v.* pages 289, 293).

Symptoms.—The early symptoms caused by retention are too well known to need mention ; when, however, the bladder becomes much over-distended the symptoms alter, and so sometimes give rise to confusion. Such a degree of over-distension can only occur when the bladder has become an abdominal organ, as is the case in retention due to retrodeviation of the uterus. In such cases the most urgent symptom is intense pain referred not only to the bladder, but to the pelvis generally. The pelvic pain is due to the pressure of the enlarged uterus, and to some extent masks the nature of the case. The initial desire to empty the bladder may completely pass away, and be replaced by the fancy that the bladder is empty. This notion is, to a great extent, due to the fact that the urine dribbles away involuntarily from the over-distended bladder, and that, consequently, the patient considers that "she is emptying the bladder every few minutes." To this form of incontinence, the term *ischuria paradoxa* has been applied.

Diagnosis.—The diagnosis of distension of the bladder can be made, in a case of considerable distension, by palpation, or, in a case of slight distension, by mapping out the outline of the bladder by percussion. An over-distended bladder must be distinguished from an enlarged uterus or tumour. This can be done from the history of the case and from the results of a bi-manual or vaginal examination. In retention due to uterine prolapse, the distended bladder will be found in the pelvic cavity.

Treatment.—In cases due to prolapse, there is usually no difficulty in passing a catheter and drawing off the urine. The prolapse must then be suitably treated in order to prevent a return of the retention. In cases of retention due to retro-deviation of the uterus, it is often

very difficult to empty the bladder. The causes of this difficulty are the upward displacement of the urethral orifice, caused by the mal-position of the uterus, as this may render it difficult or impossible to pass a catheter into the orifice ; the compression of the urethra by the enlarged uterus ; and, even after the catheter has reached the interior of the bladder, the blocking of its eye by detached pieces of vesical mucous membrane. If, in these cases, an ordinary metal female catheter cannot be passed, a male gum-elastic catheter must be tried. Barnes recommended that "the point of the catheter, instead of being directed a little backwards under the pubic arch, be directed close up behind the symphysis.

It should, in the first instance, be passed in as far as it will go, and then, when the urine ceases to flow, withdrawn by slow degrees, when more urine will often flow as if the catheter tapped fresh pouches of the bladder." If the attempt at introduction proves unsuccessful, the patient must be placed in the knee-chest position and an attempt again made with a gum-elastic catheter. Sometimes it may be possible to lessen the pressure upon the urethra by introducing a finger into the vagina and pressing the cervix backwards. If even this attempt fails, it is usually necessary to puncture the bladder supra-pubically and to draw off the urine. To do this the needle of the aspirator is introduced in the middle line about two inches above the symphysis.

INCONTINENCE OF URINE AND BLADDER IRRITABILITY.

Slight incontinence of urine, leading to the escape of water during the act of coughing or straining, is not an infrequent condition, especially amongst multi-

paræ. Irritability of the bladder is also common, especially in the early months.

Causes.—Incontinence during pregnancy is caused by a relaxed condition of the sphincter, probably due to stretching and compression of the neck of the bladder during a previous pregnancy, associated with the increased intra-abdominal pressure that results from the enlarged uterus. Irritability of the bladder is the result of the increased pressure to which the bladder is subjected, and is most marked while the uterus is a pelvic organ—*i. e.* up to the end of the fourth or fifth month. After this time the uterus rises into the abdomen, and almost all its weight is taken by the abdominal wall and iliac bones; consequently, there is at once more room for the bladder to expand, and less pressure upon it.

Treatment.—Little can be done for the relief of incontinence during pregnancy. If it occurs, the patient must be warned of the importance of keeping the skin of the vulva and perinæum as dry and free from urine as possible, as otherwise an unpleasant erythema results. An ointment rubbed on the parts will prevent the urine from remaining in contact with them. Bladder irritability may be alleviated by the administration of tincture of hyoscyamus, and at the same time the patient ought to be advised to refrain from drinking excessive quantities of fluid, particularly such fluids as she finds by experience have a diuretic effect. When the irritability occurs during the early part of pregnancy, it is usually safe to promise that the condition will pass off in a little time.

ANÆMIA.

Normally the number of red blood-corpuscles is

increased during pregnancy, but sometimes the opposite is the case. The commonest causes of this condition are bad food, bad digestion, constipation, and insufficient exercise in the open air.

Treatment.—The treatment is largely prophylactic. If any active measures are necessary, iron in some form is to be administered. Malt preparations containing hæmoglobin are also of considerable value. The bowels must be regulated by the use of purgatives, and for this purpose tablets containing aloin in conjunction with ferrous carbonate are of use.

HYDRÆMIA.

Hydræmia sometimes occurs in connection with anæmia, and not infrequently causes œdema of the lower extremities and vulva. If the presence of renal disease is excluded, this condition is of slight importance, but, if the labia are excessively œdematous, they may offer an obstruction to delivery, or even in some cases may become gangrenous. Unless either of these terminations is feared, the condition requires little treatment.

Treatment.—If the œdema is moderate, rest in the recumbent position and the application of lead lotion will relieve it. In case of enormous distension of the labia, it may be necessary to puncture them. The danger of this proceeding is that infection may occur leading to suppuration in the cellular tissue; consequently, it should only be adopted if necessary, and then every precaution must be taken to prevent infection.

VARICOSE VEINS.

Varicose veins frequently form in the later months

of pregnancy, especially in the lower limbs and about the vulva.

Treatment.—Their treatment is at first palliative, as a radical operation is contra-indicated. An elastic bandage applied to the affected limb is usually sufficient. The patient should also wear an abdominal belt to support the uterus. If the veins still continue to increase in size, and threaten to rupture, the patient should be kept in a recumbent position. In rare cases, a radical operation may have to be performed.

HÆMORRHOIDS.

Hæmorrhoids are a very common trouble at the end of pregnancy. Usually they disappear a short time after delivery, but sometimes they persist, and give rise to such annoyance as to necessitate their removal.

Treatment.—During pregnancy the only treatment which can be adopted is to keep the motions soft and regular, and to use some soothing application, as Ung. Gallæ c̄ Opio. Tr. Opii in water, and suppositories containing extract of witch-hazel are also useful, and in some cases the application of a poultice or fomentation affords relief. The hæmorrhoids should be bathed frequently with warm water.

SALIVATION.

Salivation may be extremely troublesome, but it is a rare affection.

Treatment.—Order the patient to wash out the mouth with some astringent solution, and administer internally two to four minim doses of Liquor Atropinæ Sulphatis.

PRURITUS VULVÆ.

Pruritus vulvæ, or irritation of the vulva, is a most distressing condition. It is usually caused by a vaginal discharge, but may also be due to diabetes or to parasites.

Treatment.—If vaginal discharge is the cause of the pruritus, the chief treatment is cleanliness. The patient should bathe the vulva twice or thrice daily with warm water, in which some mild astringent such as borax is dissolved. Vaginal douches also may be used, such as boracic acid (saturated solution), or weak permanganate of potash. If an erosion of the cervix is the cause of the discharge, it should be touched with pure carbolic acid or formalin; or a solution of sulphate of copper thirty grains to the ounce, or pyroligneous acid should be applied every couple of days through a cylindrical speculum. If these manipulations are performed with gentleness, there is no fear of bringing on labour. The pruritus itself may be relieved by applying some soothing ointment, as Ung. Oxidi Zinci, or resinol or hazeline ointment. This acts by preventing the discharge from remaining in contact with the skin, while it also relieves the irritation.

NEURALGIA.

Various neuralgic affections are common in pregnancy, particularly in the regions supplied by the fifth cranial nerve.

Treatment.—Local application of warmth, or of camphor or chloroform liniment, usually relieves the pain. Quinine, bromide of potash, phenacetin, anti-pyrin, or hyoscyamus, especially the first, are sometimes of use.

CHAPTER XVI.

DISEASES OF THE DECIDUA AND OVUM.

Decidual Endometritis—Abnormal Permeability of the Membranes—
Vesicular Mole—Chorion-epithelioma—Hydramnios—Oligo-
hydramnios—Anomalies of the Placenta and Cord.

DECIDUAL ENDOMETRITIS.

DECIDUAL endometritis is a most important condition, and is of by no means infrequent occurrence during pregnancy.

Varieties.—Two varieties are met with: Acute decidual endometritis, and chronic decidual endometritis.

Acute Decidual Endometritis.—This rare condition is the local manifestation of different acute infectious diseases, in which, in consequence of the altered blood-pressure, of the presence of toxins or more rarely of bacteria in the blood, inflammatory and hæmorrhagic changes occur in the decidua. In all probability those diseases which are associated with sudden and considerable alterations of temperature are most prone to cause this condition. It is probable that in all cases in which the condition occurs, abortion results. Under the microscope there is a round-celled infiltration of the decidua, the cells of which are increased in number and size. The infiltration is sometimes so excessive as almost entirely to hide the decidual cells themselves,

and in such cases a layer of pus may cover the surface of the decidua.

Chronic Decidual Endometritis.—Chronic decidual endometritis is a condition of comparatively frequent occurrence, and is one of the commonest causes of abortion.

Pathological Anatomy.—Decidual endometritis may result in hypertrophy or premature atrophy of the decidua. The former change is the more common.

In the hypertrophic form, there is a general hyperplasia of all the elements of the decidua, which is softer than normal and contains large vascular spaces. In some cases the decidua may reach a thickness of half an inch or more, and may closely invest the entire ovum. If any of the enlarged vascular spaces rupture, hæmorrhage occurs into the substance of the decidua and in particular collects between the decidua and the membranes of the ovum. The blood then clots and layers of fibrin are deposited upon the chorionic villi. As a result of this condition, the membranes, instead of presenting a smooth surface towards the fœtus, present a surface covered with hills and hollows, resembling a mass of thrombosed veins. If a section is made through the decidua, the hills are found to be composed of masses of fibrin, outside which lies a greatly thickened decidua full of extravasated blood. To this condition the terms "apoplectic ovum" and "tubercular ovum" have been applied.

Such an alteration in the character of the decidua necessarily interferes with the blood supply of the embryo, and in consequence the latter dies, usually during the first two months of pregnancy. It may then be absorbed and disappear, or it may be found as a tiny almost unrecognisable mass hanging at the end of a short and often bladder-like cord. If the amount

of intra-decidual hæmorrhage is sufficient to effect the detachment of the decidua and ovum from the uterus, abortion occurs. If, however, a slight vascular connection with the uterus still persists, the decidual cells may continue to multiply, the masses of fibrin become organised, the remains of the chorionic villi disappear, and the ovum becomes converted into a mass of tissue resembling the decidua. To this condition, the terms placental or fibrinous polypus and deciduoma benignum have been applied.

When the decidual endometritis gives rise to a profuse watery discharge, the term catarrhal decidual endometritis, or shortly catarrhal endometritis, is applied to it. The watery discharge which it causes is known as decidual hydrorrhœa, a condition which is sometimes included under the more general term hydrorrhœa gravidarum. In decidual hydrorrhœa the decidua is inflamed, the glands particularly being involved, and a watery fluid is secreted by them which accumulates in pouches between the decidua vera and the reflexa. When the amount of fluid in a pouch has become so considerable that there is no further room for its storage, it bursts its way downwards and escapes through the uterine orifice.

Ætiology.—The cause of chronic decidual endometritis is in most cases a pre-existing endometritis, that is to say, a fertilised ovum becomes implanted upon a diseased endometrium, which in turn forms a diseased decidua. Decidual endometritis may also result from an undue congestion of the uterus during pregnancy, even when the endometrium was previously healthy. Backward displacements of the uterus are particularly prone to give rise to such congestion, and, as is well known, they are frequently the cause of abortion. Syphilis and renal diseases are also common causes of

decidual endometritis, and particularly affect the decidua basalis.

Symptoms.—Decidual endometritis may cause slight recurrent hæmorrhages, the death and expulsion of the ovum, or hydrorrhœa. In the last case the accumulation of fluid may begin at any time after the decidua vera and decidua reflexa have come into contact with one another, and the first escape of fluid may thus occur from the fourth month onwards. At first, half an ounce (14·2 c.cs.) or so is all that escapes, but as the uterus enlarges, and as, consequently, there is room for a greater accumulation of fluid, the amount which comes away at one time may amount to fourteen ounces or even a pint (397·6 c.cs. to 568 c.cs.). If the discharge is large in quantity and escapes frequently, the condition of the patient may be affected prejudicially by it, but usually it produces little or no constitutional effect.

Diagnosis.—Decidual endometritis can only be recognised during the continuance of pregnancy in the cases in which it gives rise to hydrorrhœa. In other cases its existence is only determined when it has caused abortion, although its presence may be suspected owing to the occurrence of repeated slight attacks of hæmorrhage. The only point in the diagnosis which is of clinical importance is the recognition of the origin of the watery discharge. Such discharge may be due to decidual endometritis, or to one of three other conditions :—

(1) *Involuntary Escape of Urine.*—This can be distinguished from decidual hydrorrhœa by examining the patient as soon as possible after the flow has come away. If the flow has come from the uterus, the vagina will be moist. Further, if any of the escaped fluid can be obtained it will be found to be neutral or

alkaline in the case of hydrorrhœa, and usually acid in the case of urine.

(2) *Rupture of the Membranes*.—This naturally only occurs once, and is followed by the onset of labour. Moreover, on palpation, the uterine walls will be found contracted down upon the fœtus.

(3) *So-called "Amniotic Hydrorrhœa,"* — (v. page 278).

Treatment.—All that can be done during pregnancy is to remove any cause of congestion which may be present, such as uterine displacements, and possibly to promote a more healthy tone in the uterine fibre, and so to regulate the amount of blood going to the uterus, by the administration of ergot and strychnine. There is considerable difference of opinion as to the advisability and utility of administering ergot during pregnancy to a patient suffering from slight recurrent hæmorrhages. Many obstetricians are opposed to its use, on the ground that any effect it may have on hæmorrhage is due to the induction of uterine contractions, and that such contractions increase the tendency to premature expulsion of the ovum. We have not found this to be the case, and have no hesitation in administering the drug in cases of slight hæmorrhage in the early months, provided painful uterine contractions have not occurred. It is best given as a pill containing three grains of the extract of ergot and a thirtieth of a grain of strychnine. It apparently exerts a beneficial influence. The administration of *hydrastis canadensis* has also been recommended on account of its action in causing contraction of the fibres of the blood-vessels without producing any effect upon the uterine muscle. The usual dose of the drug is from fifteen to twenty minims of the liquid extract.

If decidual hydrorrhœa occurs the patient must be

kept in bed for a few days after each escape of fluid, on account of the risk that the sudden flow may lead to the occurrence of uterine contractions. It may be that the administration of ergot and strychnine may be of benefit in these cases by diminishing uterine congestion. Ergot, however, should in no case be given if there is any indication that contractions of the uterus are occurring. In such cases opiates may be given instead.

ABNORMAL PERMEABILITY OF THE MEMBRANES.

In certain cases the liquor amnii finds its way in small quantities through the membranes and escapes through the uterine orifice, even though there has been no apparent rupture of the membranes; to this escape of fluid the term *amniotic hydrorrhœa* is applied. This condition is a more common cause of hydrorrhœa than is decidual endometritis; it, however, occurs later in pregnancy, and is rarely met with before the eighth month.

Ætiology.—The pathology of this condition is obscure. In some cases the fluid apparently makes its way through small tears in the membranes, which may, perhaps, be the result of some degenerative process. In others the amnion is in great part wanting, and transudation of fluid occurs through the chorion. In others, again, the fluid finds its way through the amnion alone, and collects in a pouch between the membranes, whence it escapes owing to rupture of the chorion. In some cases, where the hydrorrhœa is apparently the result of abnormal permeability of the membranes, the latter may have really ruptured high up, while the uterine orifice is still undilated.

Symptoms.—The symptoms of this condition are identical with those of catarrhal decidual hydrorrhœa,

except that, if the hydrorrhœa is due to rupture of the membranes, it may come away continuously in little gushes. If the hydrorrhœa is due to the rupture of a pouch between the membranes and the uterine wall, or between the chorion and amnion, the fluid comes away with a rush, as in decidual hydrorrhœa.

Treatment.—There is no treatment for this condition except to try to prevent the onset of labour. The patient must be kept at rest in bed for several days, and opiates may be given with the object of checking uterine contractions.

VESICULAR MOLE.

This is the term applied to a cystic degeneration of the chorionic villi, accompanied by proliferation and increased activity of their epithelial coverings. It is also known as hydatidiform mole and myxoma chorii. The latter term is, however, misleading. As a result of the changes in the villi, the fœtus, as a rule, dies and is absorbed, while the cysts go on increasing in number, and finally fill the entire uterus (*v.* Fig. 122). They vary in size from that of a grape to that of a pin's head, and are described as resembling a mass of white currants floating in red currant juice. The change begins before the end of the third month. In a twin pregnancy, one ovum alone may be affected.

Frequency.—At the Rotunda Hospital, amongst 38,227 patients, the relative frequency of vesicular mole was one in 1646·68, *i. e.* 0·06 per cent.

Ætiology.—Little is known as to the direct causation of vesicular mole. It occurs particularly in multiparæ, and after chronic catarrh of the mucous membrane (Winckel); we have, however, seen a case in a primipara, and another in a 2-para. It is said to tend to

recur in subsequent pregnancies. As it starts in the chorionic villi, it can only be the result of conception.

Pathological Anatomy.—The macroscopical appearance of a vesicular mole varies somewhat according to the extent to which it has involved the ovum. If the



FIG. 122.—Uterus containing a vesicular mole, with a clot near the cervix. (*Marchand.*)

degeneration is advanced, the entire ovum is involved, and almost all its original structure is destroyed. If the degeneration is a stage less advanced, an amniotic cavity of the usual size may be found, invested more or less completely by the degenerated chorion, and con-

taining no trace of embryo, save perhaps a little detritus or a fragment of the umbilical cord. In these cases the foetus has been absorbed. If the degeneration is only beginning, a portion of the chorionic villi alone is affected, and the amniotic sac contains a foetus.

The appearance of the mole itself is very characteristic. It is composed of a mass of small cysts, which are formed along the course of numerous pedicles. The pedicle corresponds to the original chorionic villus, while the cysts are the result of the accumulation of fluid at different intervals along its course. This fluid contains salts, albumen, and mucin, and is probably due in great part to oedema and degeneration of the stroma.

We have already described the three elements of which a chorionic villus consists (*v.* page 28). In the mole these three elements persist, but are somewhat altered. The stroma is increased in amount and degenerated, the foetal vessels have disappeared, and scattered here and there are cells which are probably offshoots of Langhans' layer and protoplasmic masses from the syncytium. The cells of Langhans' layer proliferate, and form a continuous layer round the vesicle. They are in turn covered by the syncytium, which in places shows signs of proliferation.

In rare cases the mole may grow through the decidua and so gain access to the uterine wall. If it penetrates the latter, we have what, to all intents and purposes, is a malignant growth. Such a growth, after penetrating the uterine wall, may extend into the peritoneal cavity. This condition is probably closely related to chorion-epithelioma.

Symptoms.—The subjective and most of the objective symptoms of pregnancy are present, but no foetus can be felt nor foetal heart heard, unless there happens to be a twin pregnancy. The uterus never corresponds

in size to the period of pregnancy, it may be smaller, but is usually considerably larger. It feels more tense and more elastic than normal. There is a constant, blood-stained, watery discharge, in which small cysts may be found. Their presence is, of course, pathognomonic. Constant crampy pains also occur, due to the distension of the uterus or to its efforts to expel the mass.

Terminations.—Vesicular mole is a serious condition. If untreated one of four terminations may follow :—

- (1) Spontaneous expulsion.
- (2) Death, from constant loss of blood.
- (3) Death, from rupture of the uterus.
- (4) Death, from peritoneal involvement, caused by perforation of the uterus by the cysts.

Treatment.—Empty the uterus as soon as the condition is recognised. To do this, induce labour by dilating the cervix with Frommer's dilator or a hydrostatic dilator (*vi.* page 499); the mass may then be expelled spontaneously. If expulsion does not occur, introduce the finger, or the hand, and clear out the uterus thoroughly. There will be very free hæmorrhage whilst this is being done; but, as soon as the uterus is empty, the bleeding usually ceases. Then douche out the uterus with hot creolin solution. If this does not finally check the hæmorrhage, plug the cavity tightly with iodoform gauze. Never curette in the first instance, as the curette may perforate the uterus with great ease. Frequently patients, who have expelled a vesicular mole, will return a fortnight or three weeks later, on account of a recurrence of hæmorrhage. The uterus should then be curetted thoroughly, as bits of the mole are in all probability left behind, and the scrapings subjected to a microscopical exami-

nation. If the malignant form of mole is diagnosed, the uterus must be removed.

CHORION EPITHELIOMA.

"Chorion epithelioma" is the term applied to a malignant tumour which starts in the epithelial layers covering the chorionic villi, spreads to and involves the uterine wall, and finally causes metastases in other parts of the body. We have discussed in full the nature, symptoms and treatment of this condition in other works,¹ and therefore we do not consider that it is necessary again to describe it here as its treatment belongs to gynæcology rather than to obstetrics.

HYDRAMNIOS.

This is the term applied to an excessive quantity of liquor amnii. The normal amount varies considerably, but as a rule anything up to two pints (1136 grm.) may be considered to be normal, and anything over that amount to be excessive. In hydramnios the amount may even exceed twenty pints (11,359 grm.).

Frequency.—At the Rotunda Hospital amongst 36,227 patients the relative frequency of hydramnios was 1 in 235·24, *i. e.* 0·42 per cent.

Varieties.—Two forms are described :—(1) Acute, coming on in a few hours; it is very rare. (2) Chronic, when the fluid accumulates gradually.

Ætiology.—The pathology of hydramnios is very uncertain. It is found in association with syphilis of the child, anencephalus, spina bifida, multiple pregnancy, and abnormalities of the umbilical cord and placenta.

¹ 'A Short Practice of Gynæcology,' 3rd edition, 1908; 'A Manual of Midwifery,' 1910.

and with renal and cardiac disease, anæmia, and hydramia of the mother. Ballantyne considers that hydramnios may be due to a chemical irritant which comes from the mother or the fœtus, and which excites a flow of lymph or serum ; to increased pressure in the umbilical vein and its branches arising from various fœtal diseases and deformities ; to changes in the maternal blood which allow increased transudation ; or that it may possibly be formed by fœtal urine or cerebro-spinal fluid.

Terminations.—Four terminations may occur :—

(1) Premature labour may set in, as a result of over-distension of the uterus.

(2) In less degrees of distension the patient may go to full term.

(3) The uterus may rupture from over-distension.

(4) The patient may die of failure of the heart due to the pressure of an enormous uterus.

Symptoms.—The symptoms during pregnancy are those of pressure on the abdominal and thoracic viscera, due to the over-distension of the uterus. Thus we find :—constipation from pressure on the rectum ; frequent micturition, from pressure on the bladder ; pendulous abdomen, from pressure on the abdominal wall ; vomiting, from pressure on the stomach ; dyspnœa and cardiac palpitation, from pressure respectively on the diaphragm and heart.

During labour many complications may occur. The first stage is tedious, due to the over-distension of the uterus, and consequent weakening of the muscle-fibres. Malpresentations of the child are common. At the time of the rupture of the membranes, owing to the great rush of water, the child may be swept into a malpresentation, if it is not already lying in one, and the cord may prolapse. As a result of the sudden diminu-

tion in size of the uterus, the placenta may be detached, and hæmorrhage result. The second stage may be precipitate, provided the presentation of the child is correct. The third stage, again, is tedious, owing to atony of the uterus, the placenta may be retained, and post partum hæmorrhage result.

Diagnosis.—The uterus is considerably larger than it ought to be, in proportion to the period of pregnancy. The foetus is felt with difficulty and it may be impossible to hear the foetal heart, owing to the quantity of fluid which lies between the child and the uterine wall during labour. Little can be felt by vaginal examination, except the bulging membranes, until the latter have ruptured and the presenting part has descended.

Treatment.—During pregnancy, support the uterus by an abdominal binder. Occasionally, it may be necessary to induce premature labour, owing to cardiac symptoms. When the patient comes into labour, do not allow the membranes to rupture spontaneously, as most of the troubles that occur are due to the sudden rushing away of the liquor amnii. As soon as the os is as far dilated as is considered safe, introduce as much of the hand as necessary into the vagina; pass a couple of fingers between the membranes and the uterine wall; then slip a knitting needle or the stilette of a catheter along them, and puncture the membranes as high up as possible. Keep the hand in the vagina, with the fingers plugging the os so that the liquor amnii may drain away slowly. Lastly, palpate the foetus, to ascertain if it is lying in a correct position.

OLIGOHYDRAMNIOS.

In this condition the liquor amnii is deficient in quantity, and as a result, the amniotic sac may become

partially collapsed and adherent to any part of the foetus. As the latter grows, these adhesions are drawn out into bands, and these bands occasionally encircle the foetal limbs, thus causing intra-uterine amputation and similar accidents.

ANOMALIES OF THE PLACENTA AND CORD.

Anomalies of the placenta in size, shape, or position, and of the cord in length and manner of insertion, are



FIG. 123. Placental anomalies:—I. A placenta succenturiata. II. A battledore placenta. III. A velamentous insertion of the cord.

frequently met with. The most important of these are:—

(1) *Placenta Membranacea*.—The placenta is large and greatly thinned out, so that it covers almost the entire inner surface of the uterus. Retained adherent placenta may be caused thus, as the thin placenta crumples up when the uterus contracts, instead of becoming detached.

(2) *Placenta Succenturiata*.—The placenta, instead of being composed of a single mass, has one or more detached portions, only connected with the placenta

proper by means of blood-vessels. These secondary placentaë are very likely to remain behind after delivery, and to cause post partum hæmorrhage, or sapræmia. If they cause hæmorrhage immediately after delivery, they will be discovered if the uterus is explored, but sometimes they do not begin to cause symptoms until a day or two later, and then secondary post partum hæmorrhage may set in (*v.* page 441).

(3) *Battledore Placenta*.—The cord is inserted into the edge of the placenta, instead of into the centre. The condition is of no clinical importance (*v.* Fig. 123).

(4) *Placenta Prævia*.—The normal situation of the placenta is on the anterior or posterior uterine wall, with its lower border two to four inches (5–10 cms.) above the internal os. If any part of it lies "so near the internal os, that it is torn off in the formation of the lower uterine segment," the condition is known as placenta prævia (Winckel). It will be discussed later (*v.* page 357).

(5) *Insertio Velamentosa*.—In this condition, the placental vessels which form the cord do not unite upon the surface of the placenta, but run separately for some distance along the membranes. They are thus liable to be torn when the membranes rupture, and so to cause the death of the child (*v.* Fig. 123).

CHAPTER XVII.

ERRORS OF POSITION, OR OF DEVELOPMENT, OF THE PREGNANT UTERUS.

Displacements of the Pregnant Uterus: Pathological Antelexion—Pathological Anteversion—Retro-deviation—Incarceration of a Retro-deviated Uterus—Prolapse of the Uterus. Malformations of the Uterus and Vagina.

DISPLACEMENTS OF THE UTERUS.

PATHOLOGICAL ANTELEXION. — This condition occurs when the fundus is fixed in a position of antelexion. It may be :—

- (1) Congenital.
- (2) The result of inflammation.
- (3) The result of vaginal fixation of the uterus for the cure of chronic retroversion.

If due to either of the first two causes it usually gives little trouble, and frequent micturition may be the only symptom. If due to the last cause the condition is more serious. Usually, as the uterus increases in size it breaks free from its vaginal attachment, and then no harm results. If this does not occur, as the uterus grows the cervix is gradually drawn upwards; the portion of the fundus which is attached to the vagina remains in front of, and below, the level of the cervix, so forming a kind of cul-de-sac, while the posterior uterine wall develops sufficiently to accommodate the child. When labour comes on, the child's

head is driven down into this cul-de-sac, instead of against the internal os. The cervix consequently does not dilate, and the uterus may rupture.

Treatment.—It will usually be necessary to dilate the os artificially and apply forceps. A dilator of the type of Bossi's or Frommer's cannot be used in these cases on account of the impossibility of introducing it into the cervix. Consequently, it will be necessary to use Barnes' or Champetier de Ribes' hydrostatic dilators, or to incise the cervix. If this cannot be done, it may be necessary to perform Cæsarean section.

PATHOLOGICAL ANTEVERSION.—This condition is of very common occurrence in the early months of pregnancy, and causes increased pressure on the bladder. It also occurs in the later months of pregnancy in cases of contracted pelvis, and occasionally in pluriparous women. The uterus is pushed upwards by the narrow pelvic brim, and falls forward against the abdominal wall, a pendulous abdomen resulting. The condition tends to cause malpresentations.

Treatment.—During pregnancy, the patient should wear a properly fitted abdominal belt. During labour, the belt should be replaced by a binder, and the patient should lie on her back until the head fixes.

RETRO-DEVIATION.—Pregnancy frequently occurs in a retro-deviated uterus, and then may terminate in four ways:—

(A) **Abortion.**—This happens very frequently. A retro-deviated uterus is subject to endometritis, a condition which favours the occurrence of abortion.

(B) **Restitution.**—As the uterus increases in size, it gradually rights itself, and then pregnancy continues in a normal manner.

(C) **Anterior Development.**—This is a very rare occurrence, but is sometimes met with as the result of an adherent retro-deviation. It is the reverse of the condition which may result after vaginal fixation of the uterus. The fundus remains bound down in Douglas' pouch, but the anterior uterine wall develops sufficiently to permit the growth of the fœtus. Consequently, at

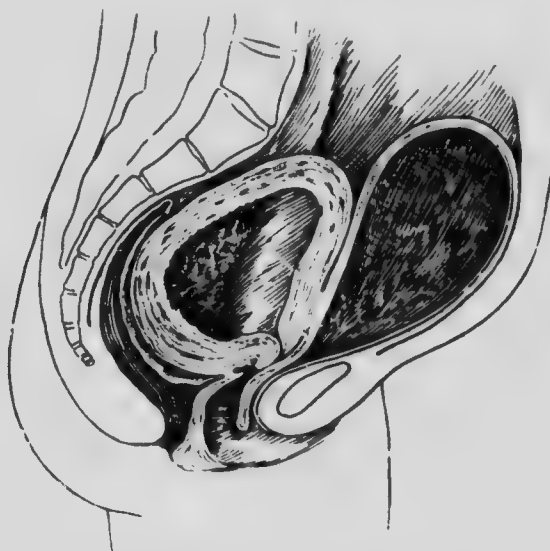


FIG. 124.—Incarceration of a retro-deviated uterus, drawn from nature. Specimen in St. Thomas's Hospital. (Barnes.)

full term, there is a cul-de-sac behind the cervix, into which the child's head is driven. The treatment in this condition is practically the same as in the case of an anterior cul-de-sac.

(D) **Incarceration.**—This is a serious condition, and, if not relieved (*i.e.* if the uterus is not replaced or emptied), will almost certainly result in the death of the woman. It is the result of the impaction of the retro-deviated uterus in the pelvis, and its occurrence is

favoured by the presence of a contracted pelvis, as the overhanging promontory prevents the uterus from rising (*v.* Fig. 124).

Symptoms.—A tumour which is increasing in size fills the pelvis; all the consequent symptoms are the result of its presence. They are :—pain, constipation, and difficulty in micturition, all of which increase from day to day. One day the patient becomes unable to pass water, her bladder becomes over-distended, and then the urine dribbles away involuntarily (*ischuria paradoxa*). It is usually while in this condition that



FIG. 125.—The knee-chest position.

she sends for medical aid. On examination of the abdomen, a tumour is felt extending up to the umbilicus, which yields a dull note on percussion. This may put us off our guard, as we may think that the tumour is the uterus, while in reality it is the over-distended bladder. On making a vaginal examination, a tumour is felt filling Douglas' pouch and pressing forwards towards the pubes. The cervix is drawn upwards and pressed forwards, so that it lies above the symphysis, and sometimes it may be impossible to feel it. The urethra is also so drawn up that it may be difficult to find its orifice in order to pass a catheter.

Treatment.—The condition having been recognised the first step is to empty the bladder, and this is sometimes a matter of great difficulty. We have already referred to the different methods recommended (*z*, page 267). As soon as the bladder has been emptied, the next step consists in replacing the uterus, under chloroform if necessary. If this can be done, a pessary is inserted, and the condition is cured. In order to replace the uterus the patient is placed in the dorsal position, two fingers are introduced into the vagina, and an attempt is made to push the fundus upwards out of Douglas' pouch. If this cannot be done, one or both fingers are introduced into the rectum, and an attempt made to push up the fundus from there. If even this fails, the patient must be placed in the knee-chest position, and a further attempt made to push up the fundus from the rectum. In some cases, even after manual efforts had failed, the use of a colpeurynter (a pear-shaped, rubber, hydrostatic, vaginal dilator) has succeeded, and so is worthy of a trial.

If repeated attempts at reposition fail, abortion must be brought on. Owing to the position of the cervix, it may be impossible to pass any instrument into the uterus, and, if all attempts fail, the uterus must be tapped with a fine trocar through the posterior vaginal wall, and a portion of the liquor amnii drawn off. This is a certain method of procuring abortion, and is sufficiently safe if all due aseptic precautions are taken. If the condition is left unrelieved, death will be the probable result. The uterine wall may slough from the continued pressure; the bladder may rupture from over-distension; a very virulent form of cystitis may result from retention and decomposition of urine; and consecutive nephritis may result from the cystitis.

Any of these conditions may give rise to septic peritonitis.

PROLAPSE OF THE PREGNANT UTERUS.—Pregnancy, occurring in a uterus which is entirely prolapsed outside the vulva, has been recorded. It is exceedingly rare. The usual condition met with is one in which the cervix protrudes out of the vagina. This may be due to a hypertrophic elongation of the cervix, accompanied by descent of the uterus, or existing alone. The result of such a condition may be serious. The exposed cervix becomes hypertrophied, its tissue dense and unyielding, and numerous ulcers form upon it. When the patient comes into labour, the cervix may not dilate, and rupture of the uterus may then result, or, even if labour proceeds normally, subsequent infection of the uterus may occur.

Treatment.—Replace the prolapsed uterus, and insert a plug pessary. If the mucous membrane of the cervix is thick and ulcerated, warm douches, glycerine plugs, and hot baths will help to soften it. If there is no inversion of the vagina, and the cervix alone is prolapsed, amputation of it in the early months of pregnancy is advisable. If the case is seen too late for this treatment, the patient must be carefully watched when she comes into labour. If the cervix does not dilate, it may have to be incised, or even Cæsarean section may have to be performed.

MALFORMATIONS OF THE UTERUS AND VAGINA.

To understand these conditions, it is necessary to refer for a moment to the development of the genital organs. Two tubes—the ducts of Müller—run down at

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each side of the spine in the early embryo. They unite in their lower half, and the septum which at first separates them disappears. From the upper ununited portions of the ducts are derived the Fallopian tubes ; from the lower portions, which coalesce, are derived the



FIG. 126.—Double uterus and vagina.

uterus and vagina. We see, then, that each Fallopian tube, with its corresponding portion of the uterus and vagina, was once a separate duct. If this point is clearly grasped, it is easy to understand the different malformations that may arise :

(1) The tubes may come into contact with one another and join together in their lower half, but may

not coalesce in the normal manner to form a single uterus and vagina. Thus an *uterus duplex* or *didelphys* is formed (v. Fig. 126).



FIG. 127.—Uterus bicornis.

(2) The tubes may not unite until the level of the



FIG. 128.—Uterus septus bilocularis.

cervix is reached, and thus an *uterus bicornis* may be formed (v. Fig. 127).

(3) The tubes may unite and the septum may persist (*a*) in the uterus—*uterus septus bilocularis* (*v.* Fig. 128); (*b*) in the vagina—*vagina septa*.

(4) One Müllerian duct may develop whilst the other remains rudimentary—*uterus unicornis* (*v.* Fig. 130).

(5) A depression may remain at the top of the fundus, corresponding to the point where the ducts united—*uterus cordiformis* (*v.* 129).



FIG. 129.—Uterus cordiformis.

In order that pregnancy may occur in any of these abnormalities, it is necessary that, at least, one side of the genital tube should be fully developed.

If pregnancy occurs in a double uterus, certain complications may arise:—

(1) Abortion. This is unusual.

(2) Tedious labour, due to the accompanying imperfect development of the uterine muscle, or to the obstruction offered by the other half of the uterus.

(3) Post partum hæmorrhage, and retained placenta.

This is prone to occur if the placenta is attached to the septum.

If pregnancy occurs in the rudimentary horn of an uterus unicornis, the condition resembles extra-uterine pregnancy. The treatment is similar.



FIG. 130.—Uterus unicornis.

CHAPTER XVIII.

THE TOXEMIAS OF PREGNANCY.

Hyperemesis Gravidarum. Eclampsia — Definition — Frequency — Morbid Anatomy — *Ætiology*: Predisposing Conditions — Symptoms: Prodromal, Actual — Diagnosis — Complications — Treatment: Prophylactic, Curative — Prognosis.

HYPEREMESIS GRAVIDARUM.

HYPEREMESIS gravidarum is the term applied to the vomiting of pregnant patients, when such vomiting becomes excessive. As will be seen, it cannot always be regarded as a toxæmic condition, but, in its severest form, it is certainly toxic in origin.

Frequency.—At the Rotunda Hospital amongst 36,227 patients the relative frequency of hyperemesis was one in 1207·56, *i. e.* 0·08 per cent.

Ætiology.—The *ætiology* of hyperemesis gravidarum is still far from settled. Some writers consider that it is often the result of hysteria or other neuroses, others that it is the result of displacements of the uterus, or inflammatory conditions of the cervix, and still others that it is usually toxic in character. We shall here consider that there are three varieties of hyperemesis—reflex, neurotic, and toxic. Reflex hyperemesis is usually the result of such conditions as uterine displacements erosion and ectropion of the cervix, ovarian tumours

and pelvic adhesions. Neurotic hyperemesis is closely allied to hysteria. Toxic hyperemesis is the most severe and dangerous of the three varieties, and is probably the result of an auto-intoxication due to failure of the eliminatory functions of the body. The cause of this failure may be some disturbance of the digestive functions, such as occurs when neglected morning sickness is associated with extreme constipation, and in renal disease when the secretion of urine is greatly diminished.

Symptoms.—The patient vomits so constantly that no food can be retained in the stomach. She is reduced to a skeleton, and, unless the vomiting can be checked, death results. In serious cases there is also frequently albuminuria, marked diminution in the amount of urine passed, and extreme constipation. As the patient gets worse there is pyrexia and very marked increase in the pulse-rate.

Treatment.—In reflex vomiting attention must be directed to such local lesions as erosion of the cervix and retro-deviation of the uterus as their treatment frequently checks the vomiting completely.

In neurotic cases the administration in full doses of sedatives, such as chloral hydrate, or bromide of potassium, will often check the vomiting by bringing about a depressant effect on the nervous system.

The first essentials in the treatment of toxic vomiting are rest in bed, the cessation of the administration of all solid food by the mouth, and the thorough evacuation of the digestive tract. In this respect the treatment is very similar to that of eclampsia, even to the washing out of the stomach if the vomit is offensive or of a markedly acid character. When the vomiting is checked, sips of water may be given repeatedly, and, after the emptying of the rectum, enemata of peptonised milk, in some cases combined

with stimulants such as brandy. Sips of champagne may also be given by the mouth, and, as the stomach becomes more tolerant, easily absorbable nutriment may be given, such as albumin water, peptonised milk, or sanatogen. When the stomach is washed out, a purgative, such as Mist. Sennæ Co., may be left in it, and sometimes will be retained. If it is voided, it may be possible to get the patient to keep down half- or one-grain doses of calomel, and after it has had time to act the rectum may be again washed out. As soon as the bowels have moved, intestinal antiseptics, such as Hydrarg. \bar{c} Cretâ (grs. v), or salol or salicylic acid (grs. x-xx), should be given. The action of the kidneys must also be encouraged by means of hot stupes, and of the skin by vapour baths. The intravenous infusion of normal saline solution, either directly into a vein or into the sub-mammary cellular tissue, is always indicated when the urine is deficient or when the patient complains of thirst. If none of these methods succeeds, then nothing remains but the induction of abortion, and if this is to be of use in saving the patient's life it must be carried out in time. As it is an extreme measure, there is a natural tendency to wait too long, and then perhaps the patient is too far gone for recovery.

Prognosis.—The prognosis of hyperemesis is bad. Joulin has reported 121 cases with 49 deaths, or something over 40 per cent. Amongst a considerably smaller number of cases at the Rotunda Hospital, the mortality was about 20 per cent.

ECLAMPSIA.

Eclampsia is the term applied to epileptiform attacks which sometimes occur in pregnant or puerperal women, and which are the manifestations of cerebral

intoxication or over-activity arising as an indirect result of the pregnancy.

Frequency.—It is difficult to estimate with accuracy the relative frequency of eclampsia, as hospital statistics—which we have to follow—show an unduly high rate. The statistics of a large number of cases drawn from various British and Continental hospitals give a rate of 1 in 357·48. In the Rotunda Hospital, amongst 36,227 patients the relative frequency of eclampsia was 1 in 258·76, *i. e.* 0·38 per cent.

Morbid Anatomy.—If a post mortem examination is made on a woman who has died of eclampsia, a series of more or less constant morbid conditions is met with. Nothing, however, has been found which can be definitely regarded in the light of a primary lesion. The most important conditions which are met with are as follows :—

The liver is more yellow in colour than usual, due to beginning fatty degeneration. Small hæmorrhages are met with both beneath the capsule and in the liver substance, and also irregular and reddish areas of necrosis, especially round the smaller portal spaces, probably due to thrombosis of these vessels, and from which emboli of fat or of liver cells may be carried to other organs. These changes are so constant in eclampsia that some French writers consider that they constitute the primary lesion, and that they are even of more importance than the renal lesions.

The kidneys are diseased in from 90 to 95 per cent. of cases. The commonest condition found is that known as the pregnancy kidney (*v.* page 263). Chronic nephritis is more rarely present. Minute areas of necrosis resembling those met with in the liver are found distributed around some of the convoluted tubes. In a very small proportion of cases, the renal changes

can be attributed to the effects of obstructive suppression of urine, due to pressure upon the ureters.

The spleen is enlarged, congested, and soft. Areas of necrosis, as in the liver, are met with, and small hæmorrhages beneath the capsule and in the spleen substance. The pancreas also presents areas of necrosis, and may be very anæmic. The brain is sometimes hyperæmic, and sometimes anæmic, somewhat œdematous with consequent flattening of the convolutions, and shows minute hæmorrhages in various parts. Small areas of necrosis due to thrombosis of the smaller cerebral vessels have also been found.

The lungs are usually œdematous, especially at their bases; subpleural ecchymoses are seen, and emboli are found, which may come from the necrotic areas in the liver or from the placenta.

Changes have been also met with in the liver and kidneys of the fetus resembling those which occur in the mother. The placenta is frequently the seat of white infarction, and it is thought that, from these areas, emboli consisting of syncytium may pass into the maternal blood and cause coagulation, in addition to the ordinary results of embolism.

Ætiology.—We have very little positive knowledge of the causation of eclampsia, and consequently there are many hypotheses.

Frerichs believed eclampsia to be uræmic in origin, *i.e.* due to the retention of urea in the blood. Stumpf considered it to be due to the circulation, in the blood, of some poison—probably acetone—produced by an abnormal decomposition in either mother or child. He also considered that this poison in its passage through the kidneys caused nephritis, through the liver a destruction of the parenchyma of that organ, and through the brain convulsions and coma. The fact

that the fœtus usually dies in these cases, the increased frequency of eclampsia in multiple pregnancy, and the improvement in the maternal prognosis consequent on the death of the fœtus, are all suggestive of a fœtal origin of the eclamptic poison. Schmorl attributed eclampsia to an intoxication by coagulation-producing ferments originating in the placenta.

Another hypothesis attributed eclampsia to the retention of the normal urinary toxins owing to a failure of function on the part of the kidney, *i.e.* a "urinaemia." Coincidentally with the onset of the premonitory symptoms of eclampsia, the urine has been noticed to contain a diminished quantity of these substances; the total amount of urine passed is also considerably diminished. Coincidentally with the recovery of the patient, the quantity of toxic substances in the urine is considerably increased, as is the total amount of urine passed. All the constituents of the urine contribute to this poisoning, notably creatin, creatinin, and carbamic acid. The failure of function of the kidneys is due, perhaps to pre-existing renal disease — pregnancy kidney, or chronic nephritis, perhaps to the effect of a fœtal toxin (Fehling), or maternal toxin (Stumpf), circulating in the maternal blood. The facts that eclampsia most frequently occurs in patients who are the subjects of pregnancy kidney, and that it rarely, if ever, occurs when this condition has been so treated that urinary suppression does not occur, strongly support this hypothesis. Supposing such a hypothesis to be correct, the necrotic areas which are met with in the various viscera can be explained by considering them to be due to some coagulation effect of the toxins on the maternal blood, or to the rupture of small vessels during the eclamptic attacks. The small proportion of cases in which there is no

renal disease can be explained by the neurotic hypothesis.

The so-called "auto-intoxication theory" originated by Bouchard attributed eclampsia to an auto-intoxication due to failure of function not only of the kidneys but of the liver. It thus differs from the foregoing hypothesis only in the inclusion of the liver as an element both in the production and the non-elimination of toxins, which may thus consist of urinary extractives, of biliary substances remaining in the blood, and of ptomaines which are no longer destroyed in the liver.

A final hypothesis—the neurotic hypothesis—was brought forward to account for those cases in which there was apparently no failure of function on the part of the kidney, liver, or other eliminatory organ. It attributes eclampsia to heightened irritability of the nerve centres, or to their over-activity caused by excessively strong stimuli from the uterus (*eclampsia reflectorica*).

Apart from hypotheses, there are certain conditions which are known to predispose to eclampsia. These are:—

- (1) Acute and chronic diseases of the kidneys, particularly "pregnancy kidney" (v. page 263).
- (2) The presence of undigested food in the digestive tract.
- (3) Long retention of the excretions.
- (4) Prolonged labour.
- (5) Elderly and very young primiparae—*i. e.* rigid uterine muscle-fibres, and so more painful labour pains.
- (6) Multiple pregnancy.

Taking into consideration the great number of different theories that are brought forward to explain the aetiology of eclampsia, the majority of which are

apparently supported by facts, we are forced to the conclusion that we should look, not for one specific cause, but for several causes, which, acting either singly or together, will be sufficient to determine the onset of fits. These causes may be classified as follows :—

I. The poisoning of the nerve centres by toxins circulating in the blood owing to :—

- (1) The accumulation of normal toxins from failure of the renal or hepatic function, owing to renal or hepatic disease.
- (2) The excessive formation of normal toxins, or the formation of abnormal toxins, either in the mother or fœtus, which toxins during their process of excretion cause nephritis, and breaking down of the liver cells, and hence a further increased amount of toxins in the blood.

In this class are found the causes of the great majority of cases of eclampsia.

II. The over-activity of the nerve centres due to :—

- (1) Their over-excitability to normal stimuli, as in the case of hysterical patients or epileptics.
- (2) Their over-irritation by excessive stimuli, as in the case of obstructed labour, very painful labour pains, elderly and very young primiparæ.

It is probable that the number of cases of eclampsia which can be correctly assigned to such causes is very small.

Symptoms.—The symptoms must be considered under two heads :—

- (A) Prodromal symptoms.
- (B) Actual symptoms.

(A) **The Prodromal Symptoms.**—These come on, in the large majority of cases, a short time before the

onset of the fits, and are of great importance, as their timely recognition and treatment may stave off the threatened attack. The first prodromal symptom of eclampsia may be said to show itself the moment a pregnant woman passes urine containing albumin, if previously her urine was normal. In this connection the following rule must be remembered :—It is *advisable* to examine the urine of a pregnant woman during the sixth or seventh month, and to ascertain the amount passed in twenty-four hours. It is *necessary* to do so, if in consequence of her history or appearance there are grounds for supposing that she is suffering from any form of renal disease. The more immediate prodromal symptoms are :—complete or partial, temporary or persistent, loss of vision ; flashes of light before the eyes ; vertigo ; headache ; drowsiness ; mental depression ; nausea ; and epigastric pain. At the same time the amount of urine excreted becomes very considerably diminished ; and, if a specimen can be obtained for examination, it is found to contain a very large quantity of albumin, and numerous granular and fatty tube-casts.

(B) **The Actual Symptoms.**—These begin with the onset of the fits. Eclampsia is rarely, if ever, met with before the sixth month, and usually occurs between the eighth month and full term. The fits may begin before the onset of, during, or after labour. The most common time is before or during labour, the rarest during the puerperium. A fit lasts from one to one and a half minutes, and consists of three stages—a preliminary stage, a tonic stage, and a clonic stage,—followed by a varying period of coma. In the preliminary stage, the eyelids twitch vigorously and spasms of the muscles of respiration occur. Then the tonic stage supervenes, and the patient lies with all her muscles contracted,

She becomes deeply cyanosed, and froth appears at the mouth. The clonic stage follows; she "works" vigorously for a time, then respiration gradually returns, and the patient lies in a condition of deep coma. The duration of coma, as a rule, varies according to the number of fits that have occurred. At first, it may only last a few minutes; but, as the number of fits increases, she lies in a continuous condition of coma during the intervals between them. The number of fits varies from one or two up to any number. They may pass off entirely for a time, and then recur. In a severe case the fits follow one another at ever-shortening intervals; the heart becomes weaker, and the lungs oedematous, at first at the bases, and then throughout. The pulse is frequent; the temperature, which was normal at first, rises as the case progresses, perhaps attaining a height of 104° F. (40° C.); total or partial loss of vision or of memory ensues, and, if the patient recovers, may persist for a considerable period after the fits have ceased.

Diagnosis.—As eclamptic fits are frequently most atypical in their form, there may at times be great difficulty in arriving at an immediate diagnosis. Too much reliance must not therefore be placed on the form of the convulsion. More important information will be obtained by studying the prodromata, the history of the case, and the attendant symptoms. Eclampsia must be distinguished from epilepsy, hysteria, drunken delirium and coma, and the coma and convulsions of meningeal and cerebral disease. As a general rule, every form of convulsion in a pregnant woman, who is suffering from renal disease, should be regarded as eclampsia until the contrary is proved to be the case. Epilepsy may be recognised by the history of former attacks, by the absence of the usual eclamptic prodromata.

mata, by the initial epileptic aura, by the sharper onset of the convulsive seizure, and by the usually complete absence of all renal symptoms. Hysteria is recognised by the irregularity of the convulsion, by the absence of respiratory spasm, of all actions which would hurt the patient, and of loss of consciousness, and by the passage of large quantities of pale urine. Alcoholic coma and delirium may be suspected by the history of the case, and the alcoholic odour of the breath. It can be definitely recognised as it passes off, and does not recur. Renal symptoms are also probably absent. The coma and convulsions of meningeal and cerebral disease may be most difficult to distinguish from eclampsia, if the history of the case cannot be obtained. The two conditions may co-exist, as cerebral hæmorrhage is an occasional occurrence in eclampsia.

Complications.—The principal complications to be feared are failure of the heart, and œdema of the lungs. They occur in almost all fatal cases, and are the direct cause of death. Hæmorrhage into the brain may occur during a fit, or may take place even after the fits have entirely ceased. We have seen a case in which the patient died of cerebral hæmorrhage, which apparently took place thirty-six hours after the last fit.

Treatment.—The treatment of eclampsia must be considered under two heads :—

(A) Prophylactic treatment.

(B) Curative treatment.

(A) **Prophylactic Treatment.**— This should be adopted in the case of every patient who has persistent albuminuria, especially if there are tube-casts in the urine. Tarnier stated that when a patient suffering from albuminuria has been on milk diet for a week, she almost to a certainty escapes eclampsia, and another French writer (Ribemont-Dessaignes) says that eclampsia occurs

almost exclusively in women whose urine has not been examined during pregnancy, and in which consequently the presence of albumin has not been detected and treated. Other writers, notably Whitridge Williams, do not accept this statement as more than approximately correct. From the point of view of treatment, however, it may be accepted, and accordingly the patient should be placed on a milk diet, and limited as far as possible to it so long as the amount of urine is insufficient. It is rarely necessary to enforce a milk diet during the entire pregnancy. Milk and other fluids must form a great part of the diet, but fish, white meat, eggs, and vegetables also may be sometimes allowed.

Even more necessary than a rigid milk diet is the due regulation of the bowels. The latter should be kept free by the daily administration of a purgative such as sulphate of magnesium, cascara sagrada, aloin, or of stronger purgatives, such as the Pil. Colocyth. et Hyoscyami (B. P.). The amount of urine the patient passes must be most carefully watched, in order that any marked diminution may be immediately detected. The dietary of the patient and the daily amount of urine passed should be in direct proportion to one another. The freer the action of the kidneys, the more liberal the dietary. If any marked diminution in the urine occurs, a hydragogue purgative must be at once administered, followed, if the diminution in the urine is considerable, by a wet pack and hot baths. The patient is also wrapped in blankets in order to favour sweating. A suitable purgative to administer in these cases consists of calomel 10 grains, combined with Pulv. Jalapæ Co. 1 drachm, and followed in six hours by an enema if necessary. If, in spite of all precautions, an eclamptic fit occurs, our treatment must then become curative.

(B) **The Curative Treatment.**—This must be chiefly directed towards two points :—

- (1) The arrest of the fits.
- (2) The staving off of complications.

(1) The fits must be checked at the earliest possible moment, as each successive fit leaves the patient more comatose, and more likely to fall a victim to the complications of a failing heart and œdema of the lungs.

There are three ways of checking or trying to check the fits :—

- (a) By removing toxic substances from the blood and tissues.
- (b) By administering sedatives.
- (c) By emptying the uterus.

(a) *By removing toxic substances from the blood and tissues.*—The immediate removal, so far as possible, of toxic substances from the organism of the patient is perhaps the most important step, inasmuch as even if they are not the actual cause of the eclampsia, they are a most serious accompaniment. Their removal is, in the main, effected by removing all traces of food from the stomach and intestinal tract, and by stopping all administration of food of any kind except water. The first step consists in washing out the stomach of the patient by means of a stomach-tube, and the lower bowel by means of copious saline enemata administered through a long rectal tube. At the same time large doses of a purgative such as castor oil or compound senna mixture are introduced into the stomach and rectum as soon as the washing out is complete. All food by the mouth is stopped, and the patient kept on nothing but water, until the convulsions have ceased for at least forty-eight hours. The amount of urine excreted must also be increased as much as possible

by such means as hot stupes over the kidneys, and abundance of fluid by the mouth if the patient is conscious. Diuresis, or, at any rate, the dilution of the toxin, can be obtained by intra-venous or subcutaneous injection of saline solution (Jardine). For this purpose, normal saline solution, made with common salt (0·6 per cent.), or bicarbonate of potash is used. From two to three pints (1136–1704 c.cs.) are injected and repeated as often as is thought necessary. In association with saline infusion, venesection has been recommended, with the object of removing some of the toxin-laden blood and replacing it by saline solution. Up to seventeen ounces (490 c.cs.) of blood have been withdrawn at a time. This may perhaps be of use when there is marked engorgement of the right heart and pulmonary circulation.

(b) *By administering sedatives.*—There are two distinct methods of treatment which fall under this heading—the chloroform and chloral treatment, and the morphia treatment.

The chloral and chloroform treatment consists in administering upon the onset of the attack, thirty grains (1·95 gm.) of chloral hydrate by the rectum; and repeating it every two hours until the fits cease, but not more than three and a half drachms (13·65 gm.) should be given in the twenty-four hours. The inhalation of chloroform is begun as soon as any sign of the onset of a fit occurs, and continued until the fit ceases.

The morphia treatment consists in the administration of large doses of morphia, hypodermically, as recommended by G. Veit. It is considerably the better method of treatment, and is carried out as follows:—Half a grain (0·32 gm.) of morphia is administered hypodermically upon the onset of the first fit, and is

followed every two hours by a quarter of a grain (0.016 grm.) until the fits cease. Not more than three grains (0.195 grm.) should be given in the twenty-four hours.

Either of these methods of treatment will check the fits; but both chloral and chloroform are said to depress the heart seriously, and consequently to favour heart failure. On this account the morphia treatment is to be preferred. On the other hand, Stroganoff, of St. Petersburg, recommends the use of chloral hydrate associated with morphia, and he records a series of 113 cases treated in this manner with only six deaths. He also administers chloroform during the attacks.

(c) *By emptying the uterus.*—Emptying the uterus is said by Dührssen to be a certain means of checking the fits. We should prefer to modify this statement by saying, that, if the patient survives the emptying of the uterus, whether by artificial or natural means, she will most probably recover. That is to say, the prognosis of the case becomes most favourable when the patient is safely delivered. On the other hand, it is necessary to remember, first, that neither all the factors nor any of the effects of eclampsia pass away the moment the child is born; and, secondly, that uterine contractions, like any other violent movement or emotion, directly excite the convulsive attacks. If the fits can be checked before labour comes on, the prognosis of the case will be improved. If labour comes on before the fits are checked, the shorter the duration of labour the better the prognosis of the case. If the fits continue in spite of all treatment, and labour does not come on of its own accord, it may be better to empty the uterus. In such a case the prognosis cannot be made worse, while it may be improved.

From the experience at the Rotunda Hospital it certainly seems best not to induce labour unless all other means of checking the fits have failed, and, if labour comes on spontaneously, to shorten its duration as much as possible, without employing such violence as would cancel the good obtained from the shortening of labour. In other words,—apply the forceps, and deliver the child, as soon as the necessary conditions for its application are present, but do not adopt such violent measures as Cæsarean section or *accouchement forcé*. Any necessary operation must be performed while the patient is under an anæsthetic, so as to lessen the shock of the operation.

If it is decided to empty the uterus before the onset of labour, the os can be dilated by deep incisions (Dührssen), by Champetier de Ribes' hydrostatic dilators, or by combined digital and instrumental dilatation. Stroganoff prefers Champetier de Ribes' dilator, on which, after its introduction, he applies traction. The special form of uterine dilator designed by Bossi, or, better, the modification of it designed by Frommer, is undoubtedly a useful instrument in careful and skilled hands for effecting dilatation of the cervix in these cases (*v.* page 499). Leopold effected delivery, after preliminary dilatation of the cervix by Bossi's dilator, in twelve cases of eclampsia without a maternal death. In most of his cases the convulsions ceased or became less severe immediately after delivery, and in none of them was there any laceration of the cervix. Seven children were extracted alive with the forceps; the remainder were born dead. When the fœtus was found to be dead before delivery, its extraction was facilitated by craniotomy. These results are good so far as they go, but the results obtained at the Rotunda Hospital without emptying the uterus are better than are any of

those afforded by a long series of cases in which emptying of the uterus has been systematically practised.

(2) Complications will be best avoided by intelligent nursing, and by paying the greatest attention to details. Whilst the patient is in a fit, she must be prevented from injuring herself. She is especially liable to bite her tongue, if it is extruded during the fit. This is prevented by the use of a gag. A very serviceable one may be made in a moment by wrapping a towel or other piece of cloth round a spoon. No food or drug may be placed in the mouth while the patient is comatose, as any liquids or solids are more likely to find their way into the lungs than into the stomach. The position of the patient must be such that the saliva, which collects in the mouth, will trickle out, instead of running down into the trachea, *i. e.* she must lie upon her side, and not upon her back. If the heart is weak and rapid, digitalin and strychnine may be administered hypodermically. If respiration ceases during a convulsion, the head and shoulders of the patient should be brought over the edge of the bed to allow any fluid in the trachea to run into the mouth, the tongue drawn forward and artificial respiration begun. Inhalations of oxygen should also be given.

We may sum up in a few words the treatment of eclampsia, as we advise it to be carried out. On the first onset of a fit, turn the patient on her side and place a gag between her teeth. As soon as possible give half a grain of morphia hypodermically. If the patient is conscious after the fit is over, give her a strong cathartic. If she remains unconscious, or if there is another fit, wash out the stomach and lower bowel thoroughly, and leave in each a large dose of a purgative. If the kidneys do not act, inject saline solution into the sub-mammary tissue. Repeat the morphia as

described, and in accordance with the number of the fits. Give the patient nothing by the mouth if she is unconscious, and, after consciousness has returned, nothing but water. If the patient's condition is improving, and if she is not in labour, do nothing calculated to bring on labour. If it comes on of itself, shorten the second stage. If the patient's condition is becoming worse in spite of the adoption of the foregoing treatment, empty the uterus after dilating the cervix with Champetier de Ribes' bag or Frommer's dilator. Watch the heart carefully and administer stimulants if required, and oxygen inhalations if the patient becomes cyanosed. Note if respiration returns the moment the actual spasm has passed off, and, if it does not, clear out the respiratory passages and practise artificial respiration.

Prognosis.—The prognosis for the infant in eclampsia is very grave. For the mother, the prognosis varies according to the time at which the fits begin. It is worse when the onset of the fits occurs during pregnancy or labour; it is better when they start during the puerperium. The greater the number of fits, the worse is the prognosis. A patient has recovered after eighteen fits (Winckel), and another after the enormous number of eighty-one (Rosenstein), but such cases are very rare; as a rule, ten fits constitute a very serious case (Dührssen). If the child dies, the maternal prognosis is improved. The amount of urine and the quantity of albumin in it, her temperature, and the condition of her heart and lungs all furnish important indications of the patient's condition.

CHAPTER XIX.

ABORTION — MISCARRIAGE — PREMATURE LABOUR — DELAYED LABOUR.

Abortion : Threatened Abortion, Cervical Abortion, Incomplete Abortion, Complete Abortion, Missed Abortion—Miscarriage—Premature Labour—Delayed Labour.

ABORTION.

ABORTION is the term applied to the expulsion of the ovum from the uterus before the complete formation of the placenta, *i.e.* before the beginning of the fourth month.

Frequency.—At the Rotunda Hospital amongst 36,227 patients the relative frequency of abortion was 1 in 29·54, *i.e.* 3·38 per cent. This number is, however, probably too small, as women usually do not go into a hospital in such cases.

Ætiology.—The causes of abortion may be divided into two groups :—

- (A) Causes which affect the attachment of the ovum to the uterus.
 - (B) Causes which bring about the death of the embryo.
- (A) **Causes which Affect the Attachment of the Ovum to the Uterus.**—Four different causes are included in this group :—(1) Diseases of the decidua or foetal membranes. (2) Interference with the develop-

ment of the uterus. (3) Direct contraction-producing agents, or so-called Oxytocics. (4) Injuries.

(1) Diseases of the decidua or foetal membranes are, perhaps, the commonest causes of abortion. In some cases they may bring about the death of the embryo, and, consequently, fall into the second group mentioned above; but, in most cases, they cause abortion by interfering with the normal relations of the decidua and the ovum. The most common pathological conditions met with are decidual endometritis, syphilis of the ovum, and beginning vesicular degeneration of the chorion. Malignant disease of the endometrium may, perhaps, be added to this group. It is, however, a most uncommon cause, as its presence usually causes sterility.

(2) Interference with the development of the uterus is a common cause of abortion. Such interference may be caused by mal-positions of the uterus; mal-development and tumours of the uterus; abdominal and pelvic tumours which press upon the uterus; and pelvic adhesions.

(3) Direct contraction-producing agents or oxytocics are to be found in certain drugs—as savin, ergot, carbonic acid gas, in excessive physical exercise or mental excitement, and in excessive sexual intercourse. All these are extremely rare causes of abortion. The drugs only cause abortion when given in poisonous doses. An accumulation of carbonic acid gas in the maternal blood sufficient to produce contractions probably only occurs under conditions which produce partial or complete asphyxia of the mother. Excessive physical exercise or mental excitement only causes abortion when occurring in association with a diseased condition of the endometrium or ovum, and then it may be the determining cause. Excessive sexual inter-

course probably only produces abortion under similar circumstances.

(4) Under the head of injuries are included all causes which can produce a sudden detachment of part of, or the whole ovum. The chief of these are falls, blows on the abdomen, the passage of instruments into the uterus, sudden increase of blood-pressure, as may occur in consequence of severe mental emotion or excitement, convulsions, vomiting, straining, or sudden exertion of any kind.

(B) **Causes which bring about the Death of the Ovum.**—The most important of these causes is syphilis directly transmitted to the ovum either by the mother or by the father. Chronic lead-poisoning of either parent may act in a similar manner. Most of the poisons mentioned above in Group (A) may also cause abortion by directly causing the death of the ovum. Decidual endometritis and vesicular mole may act in a similar manner by causing degeneration of the ovum.

Varieties.—The most satisfactory classification of abortion for practical purposes is obtained by grouping cases according to the treatment which they require. By doing this, we obtain the following varieties :—

- (A) Threatened abortion :—(1) That does not require active treatment. (2) That requires active treatment.
- (B) Cervical abortion.
- (C) Incomplete abortion.
- (D) Complete abortion.
- (E) Missed abortion.

(A) **THREATENED ABORTION.** — When a woman, who is in the first three months of pregnancy, begins to bleed, the hæmorrhage may be due to an extra-uterine pregnancy, or to a threatened abortion. The diagnosis

between the two conditions is most important and will be discussed later (*v.* page 338). If it is a case of threatened abortion, there is probably more or less pain of a colicky nature, and, if a vaginal examination is made, the cervix may be found to be somewhat shortened, and the os partially dilated.

Treatment.—According as the hæmorrhage is slight or is severe, so the patient will not or will require active treatment, according to the rate and strength of the pulse, and her appearance and general condition. It is never possible to say whether a threatened abortion is inevitable or not, unless a portion of it has left the uterine cavity. It is always possible to say whether a patient has lost as much blood as we consider safe. If it is a case which does not require active treatment, we try to stave off the threatened abortion. With this object in view the patient should be kept at rest in bed until all hæmorrhage and pain have ceased for three or four days, and opium may be given to relieve the pain. The liquid extract of *hydrastis canadensis* also may be used (*v.* page 277).

If, on account of the hæmorrhage, we believe the case to require active treatment, one of two methods must be adopted :—the ovum must be removed by the finger or a curette; or the vagina must be plugged. These methods are not alternatives; if it is possible to adopt the first we should do so; if we cannot, the second method must be adopted. If this rule is followed, we shall plug the vagina in somewhat less than one per cent. of cases of abortion requiring active treatment. It is possible to empty the uterus immediately, if the os will admit one finger, or even a curette. The former is to be preferred, as it removes the ovum more completely. Pass as much of the hand as is necessary into the vagina, and one finger into the uterus.

Detach the ovum with the finger. Then remove the finger from the uterus, and place it under the fundus, *i. e.* in the anterior fornix, if the uterus is normal in position; in the posterior fornix, if the uterus is retroverted. Sink the other hand into the abdomen, and compress the fundus between the two hands (*v.* Fig. 131). The ovum is thus driven out of the uterus into

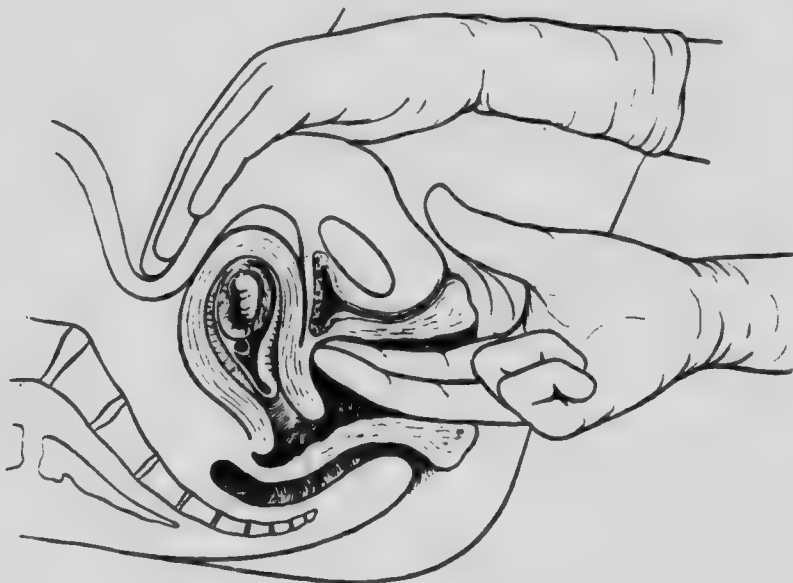


FIG. 131.—Bimanual method of expressing a detached ovum.

the vagina and removed. The uterus should then be well douched with hot cyllin solution. If proper aseptic precautions have been used, the case will give no further trouble.

If the os is not large enough to admit a finger, fix the cervix with an American bullet-forceps, and curette away the ovum with Rheinstädter's flushing curette (*v.* Fig. 132). In the small proportion of cases in which the os is not large enough to admit even a curette, and the

hæmorrhage is so severe as to require treatment, the vagina must be plugged with sterilised cotton-wool or iodoform gauze. The plug is left in for twelve to twenty-four hours, and then taken out. The os will then be found to be sufficiently dilated to permit the removal of the ovum with the finger. The dangers of plugging the vagina, unless the plugging is aseptically performed, are considerable, and, even if the plug itself is aseptic, blood may stagnate above it and putrefy. The decomposition then extends to the uterus, and, though the patient seldom actually dies as a result of this, she is frequently left an invalid for years, from tubal disease and pelvic peritonitis. In order to prevent the accumulation of blood above the plug, it is advis-



FIG. 132.—Rheinstädter's flushing curette.

able, in all cases in which the os is sufficiently dilated, to plug the uterine cavity as well as the vagina.

(B) CERVICAL ABORTION.—This condition occurs when the ovum is displaced from its situation in the uterus, and is expelled into the cervix. The external os does not dilate to allow it to pass, and the internal os contracts to some extent above it. It is thus retained in the cervix.

Treatment.—Incise the external os bilaterally, and so make it sufficiently large to allow the passage of the ovum; then, express the ovum in the ordinary manner; and, lastly, stitch up both incisions. One stitch at each side is usually sufficient.

(C) INCOMPLETE ABORTION.—An incomplete abortion consists in the coming away of any part of the ovum, the remainder being retained in the uterus.

Treatment.—As soon as the condition is recognised turn the incomplete into a complete abortion, *i.e.*, remove what is left behind. If the patient is seen immediately after the portion of ovum has come away, and the os is still dilated, attempt to express the remainder of the ovum as directed above. If this fails, and if the os is sufficiently dilated, introduce the finger, and detach and express the ovum. If this fails, or if it cannot be performed owing to the contraction of the os, curette the uterus carefully with a blunt Rheinstadter's curette, having previously dilated the cervix if necessary. Never use a sharp curette in such a case, unless it is of long standing and the uterus comparatively firm, as it is very easy to curette away the soft muscle-fibres. Never plug the vagina in incomplete abortion, as decomposition is certain to occur above the plug. On the other hand, it is sometimes very useful to plug the utero-vaginal canal with iodoform gauze, after the uterus has been emptied, in cases of continued hemorrhage, or where there is decomposition proceeding inside the uterus.

The expectant treatment of incomplete abortion is only mentioned to be condemned. It consists in waiting until one of three things happens.

(1) The remainder of the ovum comes away. This is the most favourable termination, but it is the commonest.

(2) The ovum decomposes.

(3) The patient loses so much blood that it is considered inadvisable to allow her to lose any more.

If either the second or third event occurs, and only then, is the uterus emptied. This is extremely bad treatment. It is much more dangerous to remove an ovum which is decomposed than one which is not. Again, a woman, who is weakened by repeated hemorrhage,

hage, is more liable to become septic than one who has the normal quantity of blood in her body.

1) COMPLETE ABORTION.—A complete abortion consists in the coming away of the entire ovum. It requires no special treatment. The patient should remain in bed for a few days, and then should be examined to see if there is any local condition, such as a discharges, to account for the abortion.

2) MISCARRIAGE.—An abortion is said to be miscarriage when the ovum dies, but is not expelled. It may remain in the uterus for some weeks, or even

Symptoms.—The patient has obviously been pregnant. The uterus has increased to a certain size, but now has ceased to enlarge. The signs of pregnancy disappear, the uterus diminishes in size, any breast changes which may have occurred disappear. If the membranes rupture, the foetus is expelled and causes a sanious discharge.

Treatment.—Dilate the cervix and empty the uterus with the finger or with a curette.

Diagnosis.—The diagnosis between ectopic gestation and abortion will be discussed in the next chapter. We shall now only consider the diagnosis of the different varieties of abortion. To enable us to form this diagnosis two points must be attended to:—

(1) The nurse must keep everything that comes away from the vagina of the patient.

(2) The medical attendant must inspect such dejecta carefully with a view to discovering:—(a) whether the case is one of abortion; and, if so, (b) whether it is complete, (c) or incomplete.

If nothing but blood comes away, the case may be a threatened abortion, or it may be an extra-uterine pregnancy. If either a fœtus or chorionic villi are found among the discharged matter, it must be a case of abortion. If the whole ovum has come away, it is a complete abortion; if only a part of it has come, it is an incomplete abortion. In many cases of abortion, unfortunately, everything that has come away has been

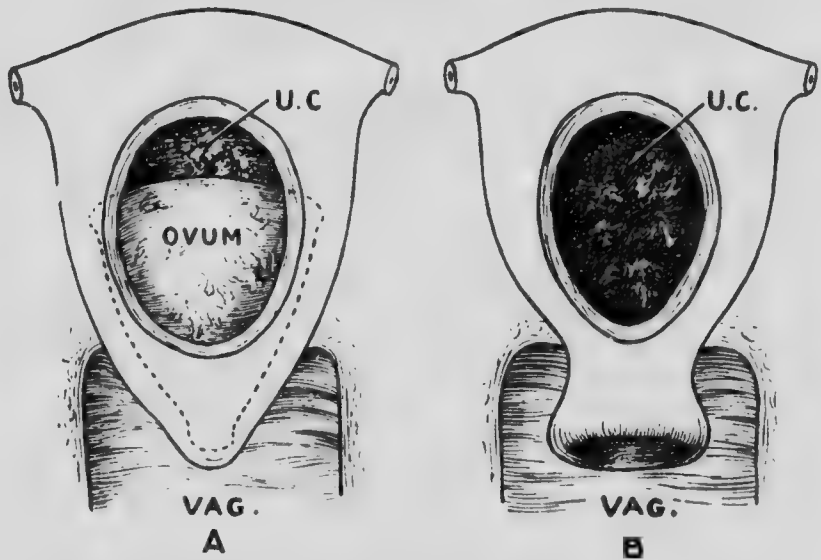


FIG. 133.—Diagram representing the shape of the cervix. A. during, and, B, subsequent to, the expulsion of the ovum. U.C. Uterine cavity.

thrown out by the patient's friends or by the nurse. Then we have to rely on the history of the patient, and on the results of a vaginal examination. The former is untrustworthy, and, consequently, we must depend almost entirely upon the latter. Two points will aid us :—

- (1) The shape of the vaginal portion of the cervix.

(2) The continuance of hæmorrhage.

(1) The shape of the cervix varies, according as the ovum is in the act of distending the cervix, or has already been expelled. In the first place, the cervix is cone-shaped, with the base of the cone above, *i. e.* in the region of the os internum. This is due to the presence of the ovum in the cervix ;—the os internum is dilated, the os externum closed (*v.* Fig. 133). In the second case, the cervix is cone-shaped with the base of the cone below, *i. e.* in the region of the os externum, and the apex above. This is due to the fact that the os internum has closed again, whilst the os externum is still patulous.

(2) If the hæmorrhage has ceased and the os internum is contracted, the ovum has most likely been expelled. If, on the contrary, the hæmorrhage continues, and, particularly, if there is a sanious discharge, some portion of the ovum must have been left behind. In cases of doubt, our treatment is governed by the symptoms. If there is constant bleeding, the uterus must be explored, whether there is an ovum there or not. If there is no hæmorrhage, and we do not know the exact condition present, it is better to wait.

MISCARRIAGE.

Miscarriage or *partus immaturus* is the term applied to the expulsion of the ovum after the placenta is formed, but before the foetus is viable, *i. e.* before the twenty-eighth week. These cases resemble full-term labour, and usually follow a similar course. Before the fourth month, the ovum is almost universally attached to the uterus by vascular adhesions ; accordingly, the detachment of any part of it causes free hæmorrhage. After the fourth month, the placenta is fully formed, and

is the only vascular link between the uterus and the ovum. If uterine contractions occur, the os dilates, the membranes rupture, the foetus is discharged, and the placenta and membranes follow. Consequently, hæmorrhage is not a necessary accompaniment of such cases.

Ætiology.—The causes of a miscarriage are almost identical with the causes of abortion (*v.* page 316).

Symptoms.—The symptoms are similar to those of labour (*v.* page 136).

Treatment.—The case is treated in the same manner as a full-term labour. The foetus is born, and we wait the usual time for the placenta to follow. If it remains behind, it is expressed, bimanually if necessary, or if that fails it is removed digitally or manually according to the size of the cervix.

It sometimes happens that in pelvic presentation the cervix contracts round the neck of the foetus and prevents the delivery of the head. In such cases traction on the body may succeed in drawing the head through. The force of the traction must depend upon the condition and size of the foetus, as in the case of a dead foetus too vigorous traction will readily result in pulling the body away from the head. If such an accident occurs, the head may be expressed, or, if small, may be caught and pulled through the cervical canal with a pair of ovum forceps, or similar contrivance. If it is large, the finger may be passed into the mouth and the head hooked down. Failing this, it may be necessary, in the case of a large head, to seize it with a cranioclast, and thus extract it, but the necessity for such a procedure is very rare. The treatment of miscarriage associated with ante-partum hæmorrhage will be described later (*v.* page 348).

The after-treatment of a miscarriage is similar to

that of a full-term labour. As in the case of abortion, the patient should be examined in from four to six weeks after the expulsion of the ovum in order to determine, if possible, the cause of the occurrence.

PREMATURE LABOUR.

Premature labour, or *partus prematurus*, is the term applied to the expulsion of the ovum after the foetus has become viable, but before full term, *i. e.* after the end of the seventh month, and before the end of the tenth month.

Causes.—Premature labour may be caused by most of the conditions or diseases which give rise to abortion. The most important of these are the intra-uterine death of the foetus, syphilis, Bright's disease, and injuries. In addition, there are other causes to be taken into account. The chief of these are detachment of the placenta, usually as a result of its insertion in the lower uterine segment; over-distension of the uterus, as in hydramnios and multiple pregnancy; premature rupture of the membranes; and eclampsia.

Symptoms.—The symptoms of premature labour differ but little from those of full-term labour. The dilatation of the cervix may be slow, as the cervical tissues are not so soft as at full term. On the other hand, the expulsion of the foetus is more rapid. Mal-presentations are slightly more common than at full term.

Treatment.—The treatment of the case is similar to that of normal labour. The infant must be kept warm after birth, and should, if possible, be placed in an incubator.

DELAYED AND MISSED LABOUR.

Delayed labour, or *partus serotinus*, is the term applied to labour when it occurs more than forty-one weeks after conception. This is not a condition to which it is necessary to refer at any length, as labour under these circumstances does not differ from labour at full term unless the fœtus continues to grow, and so offers an obstacle to delivery owing to its increased size.

Connected with *partus serotinus* is another and very rare condition, known as "missed labour"—the term applied to the condition which results when labour does not occur spontaneously. In such a case, the fœtus dies, and the liquor amnii is gradually absorbed. Finally, if the ovum is retained for sufficient length of time, maceration, mummification, or, if putrefactive bacteria gain entrance to the uterus, putrefaction of the fœtus may occur. If the fœtus is retained for a very long time, a deposit of lime salts on the epidermis may lead to the formation of a calcified covering which invests the fœtus. To this condition the term *lithopædion* has been applied. In other cases of long retention, the fœtus becomes completely disorganised, and is found as a mass of adipocere and bones.

Symptoms.—The symptoms to which missed labour gives rise are the result of the death of the fœtus, and of the absorption of poisonous matter by the uterus. In the main these consist in a gradual diminution in size of the uterus, and an increasing difficulty in distinguishing the fœtal parts; in the occurrence of a slight brownish discharge from the vagina, becoming putrid if decomposition sets in; and in weakness of the patient, and the gradual onset of a mild cachexia with slight chills and small variations of temperature.

Diagnosis.—Missed labour has to be distinguished from the retention of a dead full-term fœtus in the sac of an extra-uterine pregnancy. In both cases the symptoms and history are very similar, but, by a careful examination, it will be possible to determine that in the case of a missed labour the fœtus is retained in the uterus, while in the case of an extra-uterine pregnancy the uterus is empty. It may be difficult to map out the uterus as a separate tumour in a case of extra-uterine pregnancy, but the passage of the sound will enable us to ascertain its position and contents, or, if necessary, the cervix may be dilated with tents and the cavity explored with the finger. As the fœtus is obviously dead, and full term passed, there is no contra-indication to either of these proceedings.

Treatment.—The treatment consists in dilating the cervix and removing the fœtus. The cervix may be dilated at first with tents, and then further dilatation obtained by the use of Frommer's or of Champetier de Ribes' dilator. In some cases, the dilatation of the cervix may bring on uterine contractions, and the fœtus be expelled. If contractions do not occur, the fœtus is extracted by traction on the leg, podalic version if necessary being first performed. If the case is one of long duration, and the fœtus is completely disorganised, the cervix must be dilated as far as possible, and the remains of the fœtus removed by the hand passed into the uterus.

CHAPTER XX.

EXTRA-UTERINE PREGNANCY.

Course of Pregnancy—Varieties—Ætiology—Before Rupture of the Tube: Symptoms, Diagnosis, Treatment—At the Time of Rupture: Symptoms, Diagnosis, Treatment—After Rupture: Symptoms, Diagnosis, Treatment—Terminations—Table showing the Varieties of Extra-uterine Pregnancy and their Treatment.

EXTRA-UTERINE or ectopic pregnancy is the term applied to the development of the ovum outside the uterus. In the vast majority of cases, this occurs, at first, in some part of the lumen of the tube, but it has also occurred in the ovary, and even primarily in the peritoneal cavity.

Course of Pregnancy.—It will, perhaps, assist the student in understanding this subject if we briefly describe the usual course of events which occur in a tubal pregnancy. The impregnated ovum lodges in one of three sections of the tube (*v.* Fig. 134), and grows there. If it lodges in the interstitial section, the growing ovum encroaches on the uterine cavity; if in the isthmus, the enlarging tube separates the folds of the broad ligament; and if in the ampulla, the ovum may protrude through the abdominal ostium of the tube. At some date, usually between the sixth and the twelfth week, the tube ruptures, or else tubal abortion occurs. Rupture is usually the result of the eroding action of the trophoblast on the tubal wall

(*v.* page 16), or, more rarely perhaps, as a result of over-distension. In the case of an interstitial pregnancy, this rupture may take place in one of three directions:—into the uterine cavity, into the peritoneal cavity, or between the separated layers of the broad ligament. In an isthmal pregnancy, rupture may take place in one of two directions:—into the peritoneal cavity, or between the separated layers of the broad ligament. In an ampullar pregnancy, rupture can occur only into the peritoneal cavity. By tubal abortion is meant the rupture or perforation of the capsular membrane that invests the ovum, with consequent

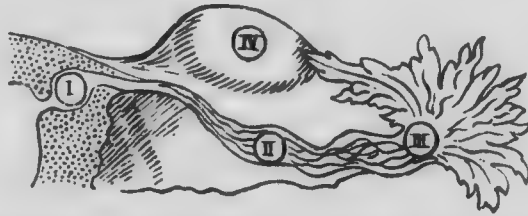


FIG. 134.—Diagram representing the various situations in which a primary extra-uterine pregnancy may develop: (1) interstitial; (2) isthmal; (3) ampullar; (4) ovarian.

hæmorrhage all round the ovum. This causes the death of the embryo and the formation of a tubal blood mole. The blood may also escape along the tube into the peritoneal cavity, and, when the ovum is situated in the ampulla of the tube, may collect behind it and cause its ultimate expulsion into the peritoneal cavity.

Rupture of the tube has two important consequences—the occurrence of hæmorrhage, and the partial or complete detachment of the ovum. If the tube ruptures into the uterine cavity the case will in all probability be mistaken for an abortion, and will cause similar symptoms. If the tube ruptures into the

abdominal cavity, or if the ovum is expelled into the cavity, more or less profuse intra-peritoneal hæmorrhage occurs. If the escaped blood becomes encysted in Douglas' pouch, the condition is spoken of as a retro-uterine hæmatocele. If the blood does not become encysted, the condition is spoken of as diffuse intra-peritoneal hæmorrhage. If the tube ruptures into the layers of the broad ligament, the hæmorrhage is extra-peritoneal. If the escaped blood does not travel beyond



FIG. 135.—Uterus and tube, showing at the right uterine cornu the site of a ruptured interstitial pregnancy. (From a specimen.)

the broad ligament, the condition is termed hæmatoma of the broad ligament. If, on the other hand, it burrows its way through the sub-peritoneal connective tissue, diffuse sub-peritoneal hæmorrhage results. Finally, if the blood becomes encysted either intra- or extra-peritoneally, the amount lost will not be very great, or, at any rate, will not be sufficient to cause the death of the patient. If, on the other hand, the hæmorrhage is diffuse, the life of the patient will almost certainly be lost unless the hæmorrhage is checked.

The second important consequence of rupture is the effect it produces on the position of the ovum. If the ovum is completely detached when the tube ruptures, it almost certainly dies; if, on the contrary, a sufficient portion of it remains attached to furnish the embryo with the necessary amount of oxygen and nutriment, the foetus may live and the ovum continue to grow. In such cases, the subsequent history very largely depends upon the site of the original rupture. In an intersitial pregnancy that ruptures into the uterus, it is conceivable that the ovum may not be detached and that pregnancy may continue, the ovum growing out into the uterine cavity, and the case becoming thenceforward one of intra-uterine pregnancy. If the tube ruptures into the peritoneal cavity, and the ovum continues to live, the primary tubal pregnancy is gradually altered into what is known as a secondary abdominal pregnancy. The ovum gradually extends into the abdominal cavity, and the placenta spreads beyond the limits of the tube until it covers the peritoneal surface of the uterus or of the intestines, and part of the pelvic or parietal peritoneum. If, on the other hand, the tube ruptures between the layers of the broad ligament, and the ovum survives that event, the latter gradually extends into the layers of the broad ligament, and the primary tubal pregnancy is altered in this case into a secondary broad-ligamentous pregnancy, or mesometric pregnancy, as it is sometimes termed.

If a secondary abdominal pregnancy results, the remainder of the course of pregnancy may be comparatively uneventful. If, however, a broad-ligamentous pregnancy results, the course of pregnancy is usually interrupted by a second rupture of the gestation sac. In a broad-ligamentous pregnancy, the ovum grows between the layers of the broad ligament, which

is pushed upwards and outwards. As the peritoneum is very elastic, it stands this distension for some time, but in some cases it finally becomes over-distended, as in the case of the tube, and ruptures. The consequences of this largely depend upon the situation of the placenta. If, as is perhaps most frequently the case, the placenta is situated above the ovum—that is, towards the top of the broad ligament, it will probably be involved in the rupture, and the most serious hæmorrhage will result, almost certainly leading to the death of the patient. If, however, the placenta is situated beneath the ovum, rupture of the thinned-out upper layers of the broad ligament can occur without involving it, and consequently without causing a fatal hæmorrhage. In such a case, the broad-ligamentous pregnancy becomes converted into an abdominal pregnancy.

When the ovum survives the rupture of the gestation sac, there are no further special symptoms until full term is reached. Then, a form of false labour may be set up, the uterus expels a decidual cast of its cavity, and the fœtus dies. If the dead fœtus is allowed to remain in the abdominal cavity, putrefaction or septic infection, or the formation of a lithopædion may result. If putrefaction or septic infection occurs, an abscess will result which may burst into one of the hollow viscera or through the parietes. Such an abscess may continue to discharge for years, if the patient lives, and during that period fragments of the fœtus will come away piecemeal. When neither putrefaction nor supuration occur, women have been known to carry about the remains of a full-term fœtus for upwards of forty years.

Varieties.—From the foregoing sections it will be seen that the different forms under which extra-uterine pregnancy is met, can be classified as follows :—

| | | | | |
|---------------------|---|-----------------------|---|--------------------|
| I. Primary forms | { | tubal | { | interstitial. |
| | | | { | isthmial. |
| | | ovarian | { | ampullar. |
| II. Secondary forms | { | from the interstitial | { | uterine. |
| | | | { | abdominal. |
| | | from the isthmial | { | abdominal. |
| | | | { | broad ligamentous. |
| | | from the ampullar | { | abdominal. |
| | | from the ovarian | { | abdominal. |

Ætiology.—The cause of ectopic pregnancy is a matter of much uncertainty. It is probable that under normal circumstances the fertilisation of the ovum may occur anywhere between the ovary and the cervix, and consequently it is probable that spermatozoa frequently find their way into the Fallopian tubes. If fertilisation occurs in the tube, the fertilised ovum passes along into the uterus and becomes embedded there. If, however, any abnormal condition interferes with the lumen of the tube to such an extent that the fertilised ovum cannot pass along it, the latter either dies or becomes embedded in the tube and forms the starting-point of a tubal pregnancy. Accordingly, the probable cause of tubal pregnancy may be stated in general terms to be some condition which causes the permanent arrest of a fertilised ovum somewhere in its passage between the ovary and the uterus. Such a condition may be found in inflammations of the tubal mucosa, diverticula, exaggerated convolutions of the tube, accessory fimbriated extremities, cicatricial bands compressing the tube and intra-tubal tumours.

In discussing extra-uterine pregnancy, we shall refer to tubal pregnancy alone, as, although a few undoubted

cases of ovarian pregnancy have been met with, such an occurrence is not sufficiently frequent to be of practical importance. The symptoms, diagnosis, and treatment will be discussed under three heads:—

- (A) Before,
- (B) At the time of,
- (C) After, primary rupture of the tube.

(A) Before Primary Rupture of the Tube.

Symptoms.—The patient believes herself to be pregnant, and displays all the subjective and objective



FIG. 136.—Fallopian tube which has ruptured at about the second month of pregnancy. (From a specimen.)

symptoms of early pregnancy. She has missed one or two monthly periods, and then slight irregular hæmorrhages occur. At the same time she complains of cramp-like pains in the lower part of the abdomen. Frequently, a history of previous sterility can be obtained. On vaginal examination a tumour is felt at one or other side of, or behind, the uterus, apparently attached to one uterine cornu. It varies in size from that of a hen's egg to that of an orange. It is unilateral, and is traversed by large blood-vessels, which can be felt pulsating through the vaginal fornix. The uterus is found to be enlarged.

Diagnosis.—The condition has to be diagnosed from a case of threatened abortion, complicated with a sacro-salpinx (*i.e.* a dilated tube) or an ovarian tumour. The marked pulsation of the tumour, the fact that it is unilateral, and the history of the case, are the most important guides. A pyosalpinx is almost always bilateral.

Treatment.—Treat the case as if it were a malignant tumour, and remove it by abdominal or vaginal celiotomy as may be thought best.

(B) At the Time of Primary Rupture of the Tube.

Symptoms.—The first symptoms of rupture are those of internal hæmorrhage,—intense pain and sudden collapse, in proportion to the amount of internal hæmorrhage. The pulse is feeble and usually rapid, but, on the other hand, it may be very slow. The temperature falls to 95° or 96° F. (35°–35·5° C.). At the same time, or a little later, the uterus usually expels a false decidua, which has been formed synchronously with the growth of the ovum, and there is accompanying hæmorrhage. The succeeding symptoms depend on what has happened, or is actually happening, inside the abdomen. As we have seen, the tube may rupture intra-peritoneally or extra-peritoneally. In the latter case the hæmorrhage usually is soon checked by the pressure of the tissues of the broad ligament, and the symptoms abate; very rarely profuse subperitoneal hæmorrhage may occur. The former case—intra-peritoneal rupture—is far more serious. If it occurs two terminations are possible:—

- (1) Diffuse hæmorrhage occurs into the abdominal cavity. This is rapidly fatal unless checked.
- (2) A retro-uterine hæmatocoele forms. This is the more favourable termination.

If a vaginal examination is made, at the time of

rupture, nothing peculiar is felt. If the existence of a tubal enlargement has been recognised previously, we may be able to determine its disappearance. When the hæmorrhage is limited by adhesions, a retro-uterine tumour will subsequently be felt.

Diagnosis.—The diagnosis has to be made from a threatened or incomplete abortion, for one or other of which a ruptured tubal pregnancy is very frequently mis-



FIG. 137.—Diagram showing the effects of a retro-uterine hæmatocele. (*Skene.*) (The relations of the bony parts in the diagram must not be regarded as typical.) A. Uterus. B. Bladder.

taken. The first point which should attract our attention is the marked disproportion between the condition of the patient, and the amount of *apparent* hæmorrhage which has occurred. The patient apparently has lost only a little blood, but she is anæmic, collapsed, with a feeble pulse, and a low temperature. Then, the decidua, which has been expelled, should be examined. No trace of chorionic villi or of a fœtus will be found.

If a hæmatocele forms, it is most important to be

able to recognise it (*v.* Fig. 137). As felt from the rectum, it is a tumour which fills Douglas' pouch, boggy in consistency, and with a dome-shaped upper surface. It invests the rectum, and the uterus can be felt anteposed. It is by recognising the fact that the uterus is anteposed that a hæmatocele is distinguished from a retroverted pregnant uterus, for which it is most likely to be mistaken. If there is any doubt the sound should be passed, as the result of a false diagnosis may be disastrous on account of the very different treatment required by the two conditions. The treatment for a retroverted pregnant uterus is to replace it; whilst any attempts to move a hæmatocele would lead to fresh hæmorrhage, and perhaps directly cause the death of the patient.

Treatment.—This depends upon the nature of the case. If the patient is seen shortly after rupture has occurred, and the condition is recognised as one of diffuse hæmorrhage, the only treatment possible consists in opening the abdomen and tying and removing the ruptured tube. This treatment is indicated in every case, unless the patient is actually moribund, as the only chance of saving her life is the immediate checking of the hæmorrhage by ligature of the bleeding vessel.

If the patient is not seen until a hæmatocele has formed, the subsequent treatment is more a matter of discussion. Some writers recommend the abdomen to be opened in all cases, and the hæmatocele to be cleared out. Others wait, on the chance of the hæmatocele being absorbed aseptically, and operate only if a rising temperature shows that suppuration is occurring. The latter is probably the better treatment to adopt in the case of a small hæmatocele. In the case of a large hæmatocele, on the one hand, the danger of putrefaction or suppuration taking place is so positive that

immediate operation is advisable. Also, if the pregnancy has reached the fourth month, and if consequently there is a placenta and a fairly large fœtus, it is better to operate in all cases. If it is decided to operate while the escaped blood is still aseptic, it is better to do so by the abdominal route, especially if we have reason to believe that there is a placenta. If, however, suppuration has occurred, the abscess should be opened through the posterior vaginal fornix, and all pus, clots, etc., should be cleared out of Douglas' pouch without breaking through the limiting adhesions which separate the space in which they are lying from the general peritoneal cavity.

(c) **After Primary Rupture of the Tube.**—As has been shown above, certain consequences may follow the primary rupture of the tube. These are:—

- (1) The patient may die, as a result of the hæmorrhage.
- (2) The ovum may die and be absorbed, or may be removed at the time of operation.
- (3) The ovum may survive the rupture and continue to develop.

The last case most frequently happens in extra-peritoneal rupture of the tube. It more rarely occurs in cases of intra-peritoneal rupture. It is with this condition we are now concerned; that is, the symptoms and treatment of a case of extra-uterine pregnancy, in which the ovum survives the primary rupture of the tube.

Symptoms.—When the ovum escapes into the broad ligament after primary rupture of the tube, and survives that event, the condition is known as a meso-metric pregnancy. The peritoneum, which forms the broad ligament, has now the same relation to the ovum as had the tube formerly, and, consequently,

as the ovum grows, it is liable to share a similar fate, *i. e.* secondary rupture may occur. We have already referred to the consequences of this (*v.* page 333).

If the ovum survives secondary rupture, or if the case is one in which primary rupture occurred into the abdominal cavity, and not into the layers of the broad ligament, there may not be any special symptoms to call attention to the condition of affairs until full term is reached. As soon as this occurs, spurious labour may set in and the uterus may expel a decidual cast of itself, and the child dies. The patient notices nothing further for a few weeks, when she may begin to think that she is past her proper time for delivery. She also notices that her abdomen is smaller, a change which is due to the absorption of the liquor amnii. If the condition is not relieved, the abdomen continues to decrease in size, and the patient at the same time becomes gradually weaker. She suffers from various subjective sensations, such as a bad taste in her mouth, nausea, shiverings, and pains in her abdomen.

Diagnosis.—It is a very difficult matter to decide for certain, in the later months of pregnancy, whether the ovum is contained in the uterus or in the abdomen. It is very difficult to distinguish between the uterus and the extra-uterine ovum, owing to the distension of the abdomen: and there is an obvious objection to the use of the sound. It is said that the absence of the painless contractions of the uterus as felt by the hand, and of the uterine souffle, are points of importance. But, inasmuch as the woman has, often, no symptoms which call attention to her condition before the normal period of termination of pregnancy, she is seldom sufficiently carefully examined to bring out these points. Consequently, the diagnosis is frequently not made until it is obvious that she is considerably past

her normal time for delivery. Then, the diminished size of the ovum may allow the uterus to be felt as a separate tumour. The introduction of the sound determines the diagnosis; this is now permissible, as the child is dead, and the patient must be delivered, whether the pregnancy is intra- or extra-uterine.

Treatment. — If secondary rupture occurs, the abdomen must be immediately opened, with the object of checking the hæmorrhage and removing the foetus. If the placenta was lying above the foetus and was involved in the rupture, the death of the patient will probably occur before assistance can be obtained. If secondary rupture does not occur, it will still be necessary to remove the foetus and placenta; the only question is, when ought the operation to be performed? If the nature of the case is recognised before the death of the foetus, are we to try to save the latter? The general opinion is, that it is better not to regard the life of the child in these cases, but to consider only the mother. Children developed outside the uterus are usually weak and likely to die, even if extracted alive; whilst the danger of the death of the mother from hæmorrhage, if the operation is undertaken at full term, is very great. The usual rule in these cases is to operate as soon as the condition is recognised, irrespective of the period of pregnancy. On the other hand, some operators hold the opinion that if the condition is recognised whilst the placenta is still small, *i. e.* in the fourth or fifth month, one should operate at once, while if, on the other hand, the condition is not discovered until after this period, it is better to wait for a month, or even two, after full term, and then to operate. By this time the maternal blood-vessels, which supply the placenta, have diminished in size, and there is less risk of hæmorrhage. For the details

of the operation itself, we refer the reader to one of the large text-books on obstetrics. It is one of the most difficult operations met with in abdominal surgery. The chief troubles are the difficulty of dealing with the placenta, and the separation of the numerous adhesions, which may form between the ovum and the intestines. It suffices to say here, that, if possible, the placenta must be removed, as there is the gravest risk of its decomposing if left behind.

Terminations.—Cases of extra-uterine pregnancy, which have advanced to full term, if untreated, may terminate in several ways. The foetus may undergo:—

(1) Maceration, mummification, calcification, saponification ; or

(2) Suppuration.

If any of the terminations in the first group occur, the child may be carried by the mother for years. A *lithopædion* is the term applied to the condition that arises, when the membranes become the seat of calcareous deposits. The mother's health is always affected at first, probably owing to absorption from the dead child. Afterwards, as the foetus becomes dried up, it only causes inconvenience by its size and weight. If the foetus decomposes or suppurates, the result is very different. A general suppurative peritonitis may start, and cause the death of the patient ; or a localised abscess may be formed. In the latter case, the abscess bursts, either externally, or into one of the hollow viscera. It will continue discharging, perhaps for years, until either the patient dies of exhaustion or amyloid disease, or the entire ovum is discharged piecemeal. She may then recover ; but such cases are rare.

The accompanying table may be of some use to the student, in understanding this complex subject (*v.* the next page).

| | If untreated this condition will terminate, before the end of the third month, in | This termination may cause respectively | If this resultant condition is untreated it will terminate in | The best line of treatment consists in |
|---|---|--|---|--|
| An extra-uterine pregnancy is most frequently | { (a) Intra-peritoneal rupture. | (a) Diffuse hæmorrhage into the peritoneal cavity. | { The death of the patient. | Immediate cæliotomy, and ligature of bleeding vessels. Rest in bed. Vaginal cæliotomy and evacuation of the septic clots. Cæliotomy and removal of the fœtus. |
| | | (b) The formation of a retro-uterine hæmatocèle. | | |
| | | (c) Slight hæmorrhage, the ovum surviving. | | |
| Tubal | { (b) Extra-peritoneal rupture. | (a) Profuse hæmorrhage into the tissues of the broad ligament, extending sub-peritoneally. | { The death of the patient. | Immediate cæliotomy, and ligature of the bleeding vessels. |
| | | (b) The formation of a hæmatoma. | | |
| | | (c) Slight hæmorrhage, the ovum surviving. | | |
| | | | Aseptic absorption. | Rest in bed. |
| | | | { Full-term extra-uterine pregnancy. Secondary rupture. | Cæliotomy and removal of the fœtus. Immediate cæliotomy. |

CHAPTER XXI.

ANTE-PARTUM HÆMORRHAGE.

Varieties—Hæmorrhage during fourth, fifth, and sixth months—Accidental hæmorrhage: Varieties of Accidental Hæmorrhage—Concealed Accidental Hæmorrhage—External Accidental Hæmorrhage: Treatment by Plugging the Vagina, Other Modes of Treatment—Unavoidable Hæmorrhage: Treatment by Braxton Hicks' Method, Other Modes of Treatment—Fœtal Mortality in Antepartum Hæmorrhage.

ANTE-PARTUM hæmorrhages, due to rupture of the vascular connections between the fœtus and the uterus, may be divided into three main classes, according to the period of pregnancy at which the hæmorrhage occurs:—

- I. Hæmorrhages occurring during the first three months, *i.e.* before the full formation of the placenta.
- II. Hæmorrhages occurring during the second three months.
- III. Hæmorrhages occurring during the last four months.

I. This class has been already discussed.

II. Hæmorrhage coming on during the fourth, fifth, and sixth months of pregnancy is not of very common occurrence. When it does occur it is sometimes difficult to treat.

Ætiology.—The hæmorrhage may be due to:—

- (1) Detachment of the placenta.
- (2) Degeneration of the ovum.

(1) From a theoretical point of view these cases could be subdivided, as will be done in Class III, into hæmorrhage due to the detachment of a normally or of an abnormally situated placenta. From a practical point of view, however, such a division would be useless, as it is impossible to distinguish between them prior to the expulsion of the ovum. Accordingly, although this distinction must be taken into account in considering the ætiology of the hæmorrhage, from the point of view of the treatment of the patient it is of no importance.

The detachment of the placenta may be due to:—

- (a) Its abnormally low insertion.
- (b) Nephritis.
- (c) Syphilis.
- (d) Endometritis.
- (e) Placental infarctions.

(2) Under this head the following causes of hæmorrhage are found:—

- (a) Vesicular mole.
- (b) Missed abortion, with the formation of a carneous mole.

The symptoms and treatment of vesicular mole have been already discussed (*v.* page 281).

Symptoms.—The symptoms vary, according to the condition of affairs present. In some cases the bleeding is constant but small in amount, in other cases it occurs at intervals in gushes, or most rarely it may occur as a single attack of flooding, which, if not checked, may prove fatal. Again, the fœtus may die as a result of the placental detachment, if large in extent, or, on the other hand, its growth may continue. Lastly, the

hæmorrhage may to a large extent be internal, *i.e.* it may be retained in the uterus, or it may be almost entirely external, *i.e.* it may pass through the cervical canal and vagina and appear externally. Accordingly, we find that, when the foetus is dead, if the hæmorrhage is external the uterus gradually diminishes in size owing to the absorption of the liquor amni; if the hæmorrhage is internal the uterus may increase in size to a marked extent, owing to the retained blood. If the foetus does not die, the uterus will increase in size only in proportion to the rate of foetal growth if the hæmorrhage is external; but, if there is considerable internal hæmorrhage, the uterus will increase in size rapidly and become larger than it ought to be for the period of pregnancy.

As might be expected, then, we find that, in the majority of these cases, the size of the uterus does not correspond to the period of pregnancy—it is usually larger but may be smaller, resembling the condition found in vesicular mole. The cervix is usually soft, and will admit the tip of, or the whole, finger. The uterus is soft, unless the amount of internal hæmorrhage is very great, when it may be very hard. If the foetus has been dead for any length of time, or if there is much blood in the uterus, it will be difficult to feel the foetus through the vagina. If decomposition occurs inside the uterus, there will be a foetid discharge and the usual symptoms of sapræmic infection. In proportion to the amount of hæmorrhage, the patient will become progressively more anæmic and weaker.

Diagnosis.—The cause of hæmorrhage can rarely be determined without exploring or emptying the uterus. As this proceeding will of necessity terminate the pregnancy, the question to be answered is not so much

what is the exact condition of affairs present, as whether it is necessary to empty the uterus or not.

Treatment.—If the hæmorrhage is slight palliative treatment is to be adopted, the main essential of which is rest in bed. If there are no uterine contractions, ergot and strychnine may be administered in combination. *Hydrastis Canadensis* has also been recommended, but its value is questionable.

The conditions under which our treatment must become active are :—

- (1) If it is obvious that the patient has lost as much blood as is safe.
- (2) If the discharge is fœtid.
- (3) If the fœtus is obviously dead.

Under these circumstances the uterus must be emptied.

If the indication for delivery is hæmorrhage, and if there is no intra-uterine decomposition, the simplest method of treatment consists in passing into the cervix as many sea-tangle tents as there is room for, choosing several small tents in preference to a couple of large ones, and then applying a firm vaginal plug below them. The plug and tents are removed in twenty-four hours, when, in some cases, the uterus will expel its contents of its own accord ; in others, the process must be hastened by bringing down a foot.

If the discharge is fœtid, it is advisable to empty the uterus at once after rapid dilatation of the cervix, and not to lose time in gradual dilatation. With the patient under an anæsthetic dilate the cervix with Hegar's dilators to a size sufficient to admit one finger. Then, feel for a foot, with the finger in the uterus, and bring it down into the vagina—if necessary after further dilatation of the cervix with the fingers. Gentle traction is then made on the leg. If the fœtus is small

it can be delivered at once, if in the sixth month the proceeding will take some time. Frommer's dilator is of use in the latter class of case, as it enables the necessary degree of dilatation of the cervix to be obtained.

When it is advisable to deliver the fœtus without waiting for dilatation of the cervix by tents, and when pregnancy has not advanced much beyond the beginning of the fifth month, we have obtained considerable assistance from Schultze's spoon forceps. This is passed into the uterus after, when necessary, preliminary dilatation of the cervix with Frommer's or Hegar's dilators, and the foot of the fœtus seized and pulled upon. The leg comes down a little way and then usually breaks. Then a fresh grip is taken higher up, and the fœtus again pulled down, and so on until finally the head is brought out, crushed, if necessary, by the spoon forceps. The fœtus is thus rapidly extracted, and with a minimum dilatation of the cervix.

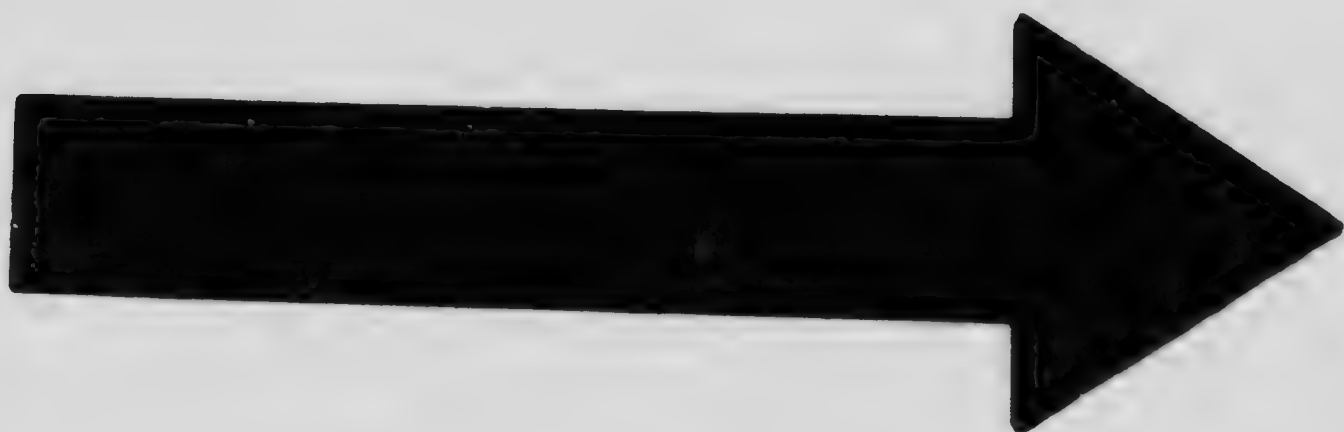
If, after the fœtus is removed, the placenta does not follow, it must be taken away with the fingers. If after this uterine contraction is not good, and there is still hæmorrhage, the uterus must be plugged with iodoform gauze. This latter proceeding is also advisable when the placenta or membranes are decomposed.

III. Hæmorrhage coming on in the last four months of pregnancy occurs as two distinct varieties :—

- (1) Accidental hæmorrhage.
- (2) Unavoidable hæmorrhage, or hæmorrhage due to placenta prævia.

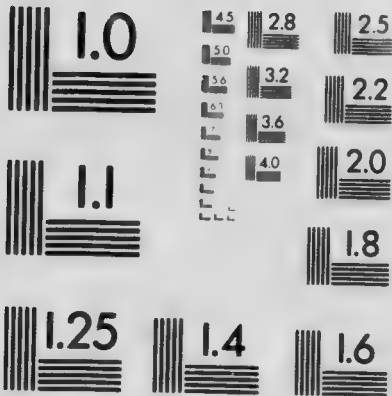
ACCIDENTAL HÆMORRHAGE.

Accidental hæmorrhage is the term applied to the hæmorrhage which results from the detachment of a normally situated placenta.



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Frequency.—It is difficult to obtain reliable statistics as to the frequency of accidental hæmorrhage, as the proportion of cases depends so much upon the limitations which are placed upon the term. If we consider that accidental hæmorrhage only occurs after the beginning of the seventh month, and if we only record cases in which hæmorrhage is sufficient in quantity to affect the treatment of the patient, we shall get a tolerably true estimation of its frequency. Estimating on this basis, in the Rotunda Hospital, amongst 35,227 patients, the relative frequency of accidental hæmorrhage was 1 in 165·42, *i. e.* 0·6 per cent.

Ætiology.—Accidental hæmorrhage is due to almost the same factors as is hæmorrhage occurring during the fourth, fifth, and sixth months. Perhaps the most common causes are nephritis, placental infarction, and decidual endometritis.

Varieties.—There are two varieties of accidental hæmorrhage :—

- (A) Concealed accidental hæmorrhage.
- (B) External accidental hæmorrhage.

These differ from one another in the conditions which permit of their occurrence, and in the treatment which they require.

(A) **Concealed Accidental Hæmorrhage.**—This is perhaps, with the exception of acute sepsis, the most serious accident to which pregnant women are liable. It is, happily, very rare. In this condition, the blood which is poured out from behind the detached placenta is stored up in the uterus, which dilates in order to make space for it, and the patient can thus bleed to death, although no blood escapes into the vagina. However, in all probability, it is only a uterus which is the subject of advanced myo-metritis which will dilate

to this extent before the blood-pressure. It is an obvious fact that blood can escape from a ruptured vessel into any cavity only so long as the pressure inside the cavity is less than the blood-pressure. If the escaping blood flows out of the cavity as quickly as it flows in, then an indefinite amount can be lost. If the blood cannot escape, then it must cease flowing as soon as the cavity is full. There is no room for any considerable quantity of blood to escape into a uterus, the muscle-fibre of which has its normal tone, *i.e.* is "healthy," and which is occupied by an unruptured ovum. If a vessel ruptures in such a case, and no blood escapes through the cervical canal, the pressure in the uterus rapidly becomes equal to the blood-pressure, and the hæmorrhage ceases. If, on the other hand, the muscle-fibre of the uterus is diseased, and yields to the blood-pressure, then the amount of the hæmorrhage is only limited by the capacity of the uterus to dilate.

This is an important fact to understand thoroughly, as it shows :—

- (1) How concealed hæmorrhage occurs.
- (2) The method by which external accidental hæmorrhage coming from a "healthy" uterus may be checked.
- (3) How useless it would be to adopt this method in concealed accidental hæmorrhage, *i.e.* in the case of a diseased uterus.

Symptoms.—The symptoms of concealed accidental hæmorrhage are those common to any form of internal hæmorrhage. Collapse, falling temperature, weak and rapid pulse, severe abdominal pain, anæmic appearance, —all occur in proportion to the amount of blood which the patient is losing. At the same time the uterus increases in size, becomes tender to the

touch, and there is an increasing difficulty in feeling the foetus.

Treatment.—The only modes of treatment which are of any avail in cases occurring before the onset of labour are *accouchement forcé*, and Cæsarean section followed by the removal of the uterus.

Accouchement forcé consists in rapidly dilating or incising the cervix, turning the presentation into a footling presentation if it is not one already, and then extracting the child by applying traction to the leg. If the hæmorrhage continues, the uterus must be plugged.

The choice between the two methods of treatment depends largely upon the skill and experience of the practitioner, and upon the circumstances under which the operation has to be performed. In a hospital where all the requisites for performing major operations are present, the removal of the uterus may be the better method. If this treatment is chosen, supra-vaginal hysterectomy is usually performed. If it is decided to perform *accouchement forcé* instead of supra-vaginal hysterectomy, the use of Frommer's dilator enables us to dilate the cervix more satisfactorily and more rapidly than was possible with the older methods, and so may perhaps improve the prognosis in these cases. The instrument deserves a full trial, as the results of manual dilatation and of hysterectomy are far from good.

If labour has begun, the hæmorrhage will probably be checked, as in external accidental hæmorrhage, by rupture of the membranes accompanied by massage of the uterus. If this is not successful, and if the hæmorrhage still continues, the foetus must be extracted.

(B) **External Accidental Hæmorrhage.**—This is also a very serious complication of pregnancy, although the prognosis is not nearly so bad as in concealed

hæmorrhage. Usually the blood escapes from the uterus as rapidly as it flows out of the ruptured vessels, and so the hæmorrhage is at once apparent. On the other hand, in many cases there is first a certain amount—greater or less as the case may be—of concealed hæmorrhage, which changes into external hæmorrhage as soon as the intra-uterine pressure becomes sufficiently great to overcome the resistance to the escape of blood. The amount of internal hæmorrhage, which takes place before the external hæmorrhage begins, as shown by the increase in the size of the uterus, affords good evidence of the condition of the uterine muscle-fibre, as the better the tone of the muscle-fibres the less the internal hæmorrhage, and *vice versâ*. If external hæmorrhage does not come on, either the bleeding ceases, owing to the increased intra-uterine pressure, or it persists as internal hæmorrhage.

Symptoms.—The escape of blood is the most prominent symptom, accompanied or preceded by a varying degree of pain in proportion to the amount of concealed hæmorrhage which has occurred or is occurring. If the condition is not treated, the usual symptoms of hæmorrhage follow.

Diagnosis.—The diagnosis has to be made from hæmorrhage due to placenta prævia, and, as a rule, it is easy to do so. Examine the patient vaginally; if the placenta can be felt through the os, or through the lateral fornices, it is a case of placenta prævia. If the placenta cannot be felt, it may possibly be a case of lateral placenta prævia, but it is to be treated as if it was a case of accidental hæmorrhage. The condition may also be diagnosed by abdominal palpation. If the head is found to be fixed in the brim, it is almost certainly not a case of placenta prævia.

Treatment.—The treatment, and to a great extent the prognosis of the case, depend upon whether the patient is having strong uterine contractions or not. If she is, the danger of the condition is greatly diminished, and the treatment is simple. If she is not, the reverse is the case. The conditions under which concealed hæmorrhage occurs were pointed out above; and it was shown that there is no room for blood to be stored in a "healthy" uterus if the ovum is intact. It is on this fact that the treatment, which we are about to describe, depends.

If we prevent the blood, which is escaping from behind the placenta, from leaving the uterus, the pressure inside the latter will rapidly become greater than the blood-pressure, and, as a result, the hæmorrhage will cease. How, then, can the escape of blood from the cervix be prevented? By tightly plugging the vagina, and so blocking the cervix. This will check the hæmorrhage, and at the same time bring on labour—the two results which we most wish for under the circumstances. At the same time labour is brought on gently, without causing any aggravation of the shock from which the patient is usually suffering, and so she is given ample time to rally from the collapse which the hæmorrhage caused, before the uterus empties itself.

To perform the operation of plugging, place the patient in the cross-bed position and wash and douche her thoroughly. Anæsthesia is not necessary, but is a great advantage. Then pass a posterior speculum, and with strips of iodoform gauze, soaked in lysol solution (0.5 per cent.), plug tightly round the cervix. The rest of the vagina is then plugged, as firmly as possible, with balls of absorbent wool about the size of a large walnut, also soaked in lysol solution. The plugging is continued

until the vagina is as full as it will hold (*v.* Fig. 138). The patient is then put back to bed, and a tight abdominal binder applied in order to increase the intra-uterine pressure by compressing the fundus, and to increase the force with which the vaginal plug is compressing the cervix by driving the uterus down into the pelvis. The cotton-wool which is used should have been



FIG. 138.—Diagram showing a vaginal tampon in position.

previously boiled for five or ten minutes. The plug is left in until strong uterine contractions begin, which usually happens in from three to four hours. In some cases, the onset of labour may be slower than this, and then the plug must be removed after twelve hours, for fear of decomposition. If the hæmorrhage comes on

again, the plugging must be repeated, but this is usually unnecessary. The success of this treatment depends upon three points:—

- (1) The uterus must be "healthy."
- (2) The ovum must be intact.
- (3) The plug must be applied tightly.

If the patient is in strong labour at the time the hæmorrhage begins, it is not a difficult matter to check the labour. If the membranes are intact, rupture them. This enables the uterine contractions to continue without at the same time causing traction on the placenta, and so detaching more of it. Also, owing to the escape of the liquor amnii, the uterus is enabled to contract down upon the child, and thus to diminish the size of the placental site. If the hæmorrhage continues, the vagina may still be plugged, as the presence of uterine contractions ensures the obliteration of the space formerly occupied by the liquor amnii, and hence there will be no room for intra-uterine hæmorrhage; or, if the os is sufficiently dilated, the fœtus may be delivered by version followed by extraction, or, if the head is fixed, by the application of the forceps.

Other Modes of Treatment.—Other modes of treatment, which are recommended by various obstetricians, are as follows:—

(1) Rupture of the membranes in every case. This is good treatment if we can be certain that the uterus will subsequently contract down upon the child. But we cannot be certain of this, unless there are strong uterine contractions. It must, therefore, be reserved for such cases.

(2) *Accouchement forcé.*—This is exceedingly bad treatment. If the patient has lost much blood, she is in danger of dying of cardiac failure, and any intra-uterine manipulations increase this tendency, particu-

larly if they are followed by the forcible extraction of the child. The only point in favour of this treatment is that it gives a lower infantile mortality. This point will be referred to again (*v.* page 364).

UNAVOIDABLE HÆMORRHAGE.

By the term unavoidable hæmorrhage is meant hæmorrhage due to the detachment of a placenta prævia, that is a placenta which is implanted so near the internal os that a portion of it is separated during the formation of the lower uterine segment (*v.* Fig. 139).

Frequency.—The same difficulty, which is met with in estimating the proportion of cases in which accidental hæmorrhage occurs, is also met with in estimating the proportion of placenta prævia, inasmuch as some writers include in their statistics cases which others reject. Estimating on the basis that only cases in which hæmorrhage started during or subsequent to the seventh month are to be included, in the Rotunda Hospital amongst 36,227 patients the relative frequency of unavoidable hæmorrhage was one in 227·84, *i.e.* 0·44 per cent.

Ætiology.—The ætiology of placenta prævia is very obscure. It is more frequent amongst multiparæ than amongst primiparæ, and is also relatively more frequent in the case of twin pregnancies. The many theories which have been brought forward may be reduced to two :—

(1) That the ovum is implanted at an abnormally low level in the uterus, and that, consequently, the placenta, when formed, lies nearer the os internum than is normal. Placenta prævia frequently occurs in patients with a history of previous attacks of endometritis, and it has been suggested that the increased

size of the uterine cavity in the latter condition allows the ovum, when it leaves the Fallopian tube, to drop into the lower part of the uterus. Webster suggests that the low implantation of the ovum may be due to its fertilisation rather later than is usually the case, *i. e.* after it has reached the lower part of the uterus.



FIG. 139.—Marginal placenta prævia. (*Ahlfeld.*)

There is, so far as we know, no reason why fertilisation should not occur when the ovum is in the neighbourhood of the lower uterine segment, but, if every such fertilisation resulted in the formation of a placenta prævia, this condition would probably be much more common than it is. This difficulty, however, can be

met by the equally probable assumption that, when such late fertilisation occurs, the ovum is, as a rule, carried out of the uterus before it has time to become implanted in the mucous membrane, and that only in the rare cases in which the ovum is not carried out of the uterus does implantation in the lower segment result.

(2) That the placenta is developed out of chorionic villi which are implanted in the decidua capsularis as well as out of those which are implanted in the normal manner in the decidua basalis, or, in other words, that there is a capsular placenta as well as a basal placenta. This theory has been verified by specimens showing a capsular placenta, and probably accounts for most cases of placenta prævia.

Hæmorrhage from a placenta prævia may be started in one of several ways:—In the case of a capsular placenta, it is probably due to degeneration and excessive thinning of the capsular portion, due to the increase in size of the ovum. In such cases, the hæmorrhage usually begins during pregnancy, or, if the union between the capsular placenta and the decidua vera is very dense, it may not occur until full term. In the case of a low implantation of the ovum, the placenta being entirely of basal origin, hæmorrhage, as a rule, is started by the beginning dilatation of the cervix and the formation of the lower uterine segment, and so is coincident with the onset of labour. As a rule, in such cases the hæmorrhage does not occur until full term, but sometimes it may occur earlier as a result of the onset of premature labour. Lastly, a placenta prævia may be detached for reasons similar to those which bring about the detachment of a normally seated placenta (*v.* page 352).

In some cases, hæmorrhage may be due to tearing of the so-called circular sinus (Meckel) of the placenta

—that is, in the outer ring of intervillous spaces which surround the placenta. The “sinus” may be torn even when the placenta is normally seated, but it is naturally more exposed to injury during labour, when the edge of the placenta passes across the uterine orifice.

Varieties.—Three varieties of placenta prævia are described :—

(1) *Placenta prævia centralis* ; in which the placenta covers the entire undilated internal os.

(2) *Placenta prævia marginalis* ; in which the placenta comes down to the edge of the undilated internal os (*v.* Fig. 139).

(3) *Placenta prævia lateralis* ; in which a portion of the placenta lies in the lower uterine segment, but does not descend so far as the undilated internal os.

Symptoms.—The chief symptom is hæmorrhage, occurring any time after the beginning of the seventh month. If the hæmorrhage continues untreated, there will be the usual symptoms of collapse.

Diagnosis.—The diagnosis is made by a vaginal examination. If the placenta is felt through the os or through the lateral fornix, it is a case of placenta prævia. If the placenta cannot be felt, then it is either a case of accidental hæmorrhage or of hæmorrhage due to a lateral placenta prævia ; in either case, the treatment to be adopted is that of accidental hæmorrhage. In a favourable subject, the occurrence of placenta prævia may be diagnosed by abdominal palpation. The points to be looked for are :—the high situation of the presenting part, and an increased sense of resistance, and an increased difficulty in feeling the fetal parts, over one part of the lower uterine segment. Further, if the presenting part is firmly fixed in the pelvic brim before labour begins or in the early part of the first stage, it is most unlikely that there is a placenta prævia.

Treatment.—As soon as the diagnosis of placenta prævia is made, the patient should be treated, because even though temporary cessation of the hæmorrhage may occur, its return is inevitable. As in accidental hæmorrhage, the treatment depends on whether the patient is, or is not, in labour. Usually she is not in labour at the onset of the hæmorrhage, and in this case the prognosis is considerably more serious. Under these circumstances the best treatment is that recommended by Braxton Hicks. It consists in turning the fetus by bi-polar version into a breech presentation, rupturing the membranes, drawing down a foot (see page 525), and leaving the rest of the delivery to nature. If it is a case of central placenta prævia, the fingers must be pushed directly upwards through the placenta in their attempt to seize the foot. This treatment checks the hæmorrhage, by the pressure of the breech or back of the child against the placenta, and also brings on labour. A piece of gauze should be tied to the foot; and, if further hæmorrhage occurs, light traction on the gauze will check it, by drawing down more of the breech. In order to carry out this treatment successfully two conditions must be present :—

- (1) The membranes must be unruptured.
- (2) The os must be large enough to admit at least two fingers.

The first condition is practically always present unless, indeed, an ignorant attendant has ruptured the membranes. The second condition is present in more than 99 per cent. of all cases of placenta prævia in which the patient is bleeding. In the rare instances in which it is not present, plug the vagina and leave the plug in for a few hours. The os will then be found sufficiently dilated to allow version to be performed.

If the patient is getting strong labour pains when

the hæmorrhage begins, rupture of the membranes is often sufficient to check the bleeding. Rupture of the membranes acts in these cases as it does in accidental hæmorrhage in the presence of strong labour pains; *i.e.* it allows the head to advance without detaching more of the placenta, and the placenta to retract upwards with the lower uterine segment, and it diminishes the size of the placental site (*v.* page 356). If the hæmorrhage still continues, the child may be delivered by the forceps, if the head is fixed, and the os dilated. If these conditions are not present, the child may be turned by internal version, and the rest of the delivery left to the natural efforts.

Other Modes of Treatment.—Other modes of treatment, recommended by various obstetricians, are as follows :—

(1) Champetier de Ribes' dilator. This method consists in introducing Champetier de Ribes' hydrostatic dilator (*v.* Fig. 180) into the amniotic cavity, after rupture of the membranes. The bag is then distended with water, and acts in the same manner as does the breech in Braxton Hicks' method. The advantages claimed for this method are the ease with which it is carried out, and the improved foetal prognosis. Its disadvantages appear to be, first, that in careless hands sepsis is more likely to be caused than by Braxton Hicks' method, inasmuch as a foreign body—possibly non-sterile—lies in the uterus for some hours, and, secondly, that it requires a special apparatus, and, moreover, one which is extremely liable to be damaged by keeping, and hence to be useless when required.

(2) Cæsarean section. This treatment has been recommended by some operators, particularly in America, on the ground that it improves the prognosis for both mother and child. This may be true so far as

the child is concerned, but it certainly does not offer so good a prospect for the mother as does Braxton Hicks' treatment. The only condition under which it seems to us to be indicated is when a central placenta prævia exists in a patient who is near full term and who is not weakened by previous hæmorrhage. Such an association is very rarely met with, since central placenta prævia usually causes hæmorrhage while the infant is still premature, and before the position of the placenta has been recognised.

(3) *Accouchement forcé*. The same objection applies to the adoption of this treatment in the case of placenta prævia, as does to its adoption in accidental hæmorrhage (*v.* page 356).

(4) Plugging the vagina. There is a considerable risk of sepsis in any case of plugging, more particularly in placenta prævia, owing to the low situation of the placenta. It should not be performed, therefore, unless it is absolutely necessary.

(5) Partial detachment of the placenta—Barnes' method. This consists in separating all the placenta which adheres to the lower uterine segment. It is performed by "insinuating a finger between the placenta and the uterine wall, and then sweeping the finger round in a circle, so as to separate the placenta as far as the finger can reach." In doing this the patient runs a greater risk of sepsis than if version is adopted, as the fingers of necessity come into very close contact with the uterine sinuses, and bacteria may be introduced if the strictest asepsis is not adopted. Barnes considered that this procedure, by accelerating the necessary process of separation of the placenta from the lower uterine segment, and by removing an obstacle to the dilatation of the cervix, shortened the time during which hæmorrhage occurred.

Complications.—Patients suffering from placenta prævia are more liable to post-partum hæmorrhage and to sepsis than are others. The former frequently occurs owing to the fact that the lower uterine segment does not contract as firmly as the fundus, and that, consequently, the uterine sinuses may be only partially obliterated. Furthermore, if rapid dilatation of the cervix and extraction are the treatment adopted, deep lacerations of the cervix are almost certain to occur. The cervix and the lower uterine segment tear very much more easily in cases of placenta prævia than in cases of normal insertion of the placenta. It thus frequently happens that, while one thinks the os is dilating under the pressure of the fingers, it is really tearing. Again, a laceration of the cervix, which would be trivial in the case of a normally situated placenta, may cause grave trouble in placenta prævia, owing to the large vessels in the neighbourhood of the cervix which supply the placenta. There is also more risk of sepsis in these cases, as the placental site lies so near the vagina, that, if any infection of the latter occurs, the former is almost certain to become infected also.

Fœtal Mortality.—It is well said that, in any case of ante-partum hæmorrhage, the life of the child must be considered as antagonistic to the life of the mother. Any treatment which yields the smallest fœtal mortality will give the largest maternal mortality, and *vice versa*. Thus, in both accidental and unavoidable hæmorrhage, Cæsarean section or *accouchement forcé* will save the greatest number of children; but they will lose many more mothers than will the treatment by plugging in accidental hæmorrhage, or by bi-polar version in placenta prævia. Even if the child is brought into the

world alive in either of these conditions, it is most frequently premature, and weak from its previous semi-asphyxia. As a result, it most frequently dies within the first month. Under these circumstances, the life of the mother should not be risked by adopting a treatment which is avowedly more dangerous for her, merely because it affords a slightly improved chance of saving the child.

CHAPTER XXII.

PRECIPITATE LABOUR — UTERINE INERTIA — RETAINED PLACENTA.

Precipitate Labour—Uterine Inertia: Varieties—Primary Uterine Inertia—Secondary Uterine Inertia—Retained Placenta.

PRECIPITATE LABOUR.

PRECIPITATE labour occurs when the contractions of the uterus are considerably stronger than are necessary to overcome the resistance of the soft parts of the mother. As a result, the child is driven rapidly through the pelvis, and is born when, perhaps, the mother is not in a suitable position. In consequence of this, the umbilical cord may be torn, the placenta may be detached prematurely, the uterus may be inverted, or the death of the child may result. Perinæal laceration may also occur.

Treatment.—If we know that a patient is subject to precipitate labour, she should be placed in bed immediately labour begins, and should not be allowed to leave it. She should refrain from bearing down, and to prevent this it is usually well to administer chloroform. By these means accidents will be prevented.

UTERINE INERTIA.

The term uterine inertia means that the contractions of the uterus are feeble, so that they either fail to expel the child, or only succeed after a long time.

Varieties.—Uterine inertia occurs in two distinct forms :—

- (A) Primary inertia.
- (B) Secondary inertia.

These are so distinct one from the other that they must be considered separately.

(A) **Primary Uterine Inertia** —In this condition the contractions of the uterus are, from the very beginning of labour, more feeble than normal. The uterus never contracts strongly.

Ætiology.—The causes of primary uterine inertia usually lie in the uterus itself, or in its contents. They are :—

- (1) Weak muscular development.
- (2) Faulty shape, as uterus bicornis.
- (3) Myo-metritis.
- (4) Over-distension, as by hydræmnios or twins.
- (5) Tumours, as myomata.
- (6) Frequent labours.

More rarely, uterine inertia is due to wasting diseases, mal-nutrition, and such like conditions, in which the mother is in a very debilitated state.

Symptoms.—The os dilates slowly ; there is only slight distension of the bag of membranes during a contraction ; no caput succedaneum forms upon the child's head ; and the hardening of the uterus during a contraction is almost imperceptible. If the head lies in the pelvis for too long a time, the patient becomes feverish and restless, and in rare cases sloughing of the vaginal walls or cervix may occur. The third stage is usually characterised by the slow expulsion of the placenta, or by its non-expulsion, and probably by the occurrence of atonic post-partum hæmorrhage.

Treatment.—In primary uterine inertia, the uterus is

obviously not sufficiently strong to expel the child, and the indication is to stimulate and assist it. This may be done by massage of its walls, stimulating food, hot vaginal douches, followed by the expression of the foetus if possible (Kristeller's method). If such treatment is not successful, the forceps must be applied as soon as the necessary conditions are fulfilled (*v.* page 512). If the contractions have not been sufficiently strong to dilate the cervix, it may be dilated with Frommer's dilator. If the head does not become fixed in the brim, delivery may be effected by version and extraction. In all cases in which artificial delivery becomes necessary, we should be prepared for the occurrence of post partum hæmorrhage, and have everything ready for its treatment. The value of pituitary extract in both primary and secondary inertia has been investigated by many observers of late. It is, perhaps, too soon to lay down definite rules for its use, but the general opinion appears to be that in both forms of inertia it markedly increases the strength of the uterine contractions, provided they were already occurring with some regularity, and that dilatation of the uterine orifice had been about half accomplished. It is said, however, to interfere with the foetal circulation owing to the tonic nature of the contractions it causes when given in patients who have been for a long time in the second stage. The usual dose is a half or one cubic centimetre, and it does not as a rule require to be repeated (*v.* page 192).

(B) **Secondary Uterine Inertia.**—In this condition the contractions of the uterus may have been of normal intensity, or even too strong, at the beginning of labour, but gradually diminish in strength as labour proceeds.

Ætiology.—A less degree of the same pathological

conditions of the uterus that caused primary inertia may also cause secondary inertia. To these conditions may be added the following:—

- (1) Distension of the bladder or rectum.
- (2) Large foetal head.
- (3) Pendulous abdomen.
- (4) Weakness or collapse of the patient.
- (5) Rigid soft parts.
- (6) Contracted pelvis.

Symptoms.—The patient has been for some time in normal, or perhaps in excessively strong labour, then the contractions gradually become more feeble, and, if the condition persists, the train of symptoms, as mentioned under primary inertia, supervenes.

Treatment.—If any obstruction is present, such as a full bladder or rectum, remove it. Correct any obliquity of the uterus by applying an abdominal binder. Give the patient an opiate, *e. g.*—Tinct. Opii 20 to 30 minims or a quarter or a third of a grain of morphia hypodermically; this will cause her to sleep, and when she awakes, she will be refreshed, and the contractions may return. If not, a hot vaginal douche may stimulate them. If she still fails to deliver herself, the forceps must be applied.

RETAINED PLACENTA.

As has been already shown (*v.* page 186), if the uterus fails to expel the placenta, it must be made to do so. It may expel the placenta immediately after the birth of the child, or it may not expel the placenta for an hour. If the uterus has not expelled the placenta spontaneously within this period, steps must be taken to expel it artificially.

Frequency.—In the Rotunda Hospital, amongst

36,227 patients, the relative frequency of manual removal of the placenta was 1 in 89·67, *i.e.* 1·11 per cent.

Ætiology.—There are four chief causes of retained placenta :—

- (1) Uterine inertia.
- (2) Morbid adhesions between the placenta and the uterus.
- (3) A *placenta membranacea*.
- (4) Hour-glass contraction of the uterus.

(1) In uterine inertia, the placenta is retained in the uterus owing to the failure of the force which normally expels it.

(2) Morbid adhesion between the placenta and the uterus is the result of decidual endometritis ; it may be so firm that it is almost impossible to detach the placenta. It may also result from the deep penetration of the chorionic villi into the muscle tissue of the uterine wall, as a result of undue activity of the early trophoblast (*v.* page 16).

(3) A *placenta membranacea* is the term applied to a large, membrane-like placenta. When the uterus contracts, it crumples up such a placenta in its interior instead of completely detaching it.

(4) Hour-glass contraction is a very rare condition. The uterus contracts circularly below the placenta, usually in the region of the retraction ring, while the fundus remains uncontracted. It is practically always due to bad management of the third stage. The attendant massages the region of the retraction ring instead of the fundus, and so causes the former to contract and prevent the passage of the placenta.

Treatment.—If the retention is due to hour-glass contraction, stop massaging the uterus ; the contraction will then probably pass off, and the placenta will be

expelled. If it is not expelled, and if expression fails, or if there is hæmorrhage and we cannot wait, introduce the fingers into the uterus in the shape of a cone, push them gently and slowly through the obstruction, and remove the placenta. Care must be taken to do this slowly and without undue force, or the uterus may be ruptured.

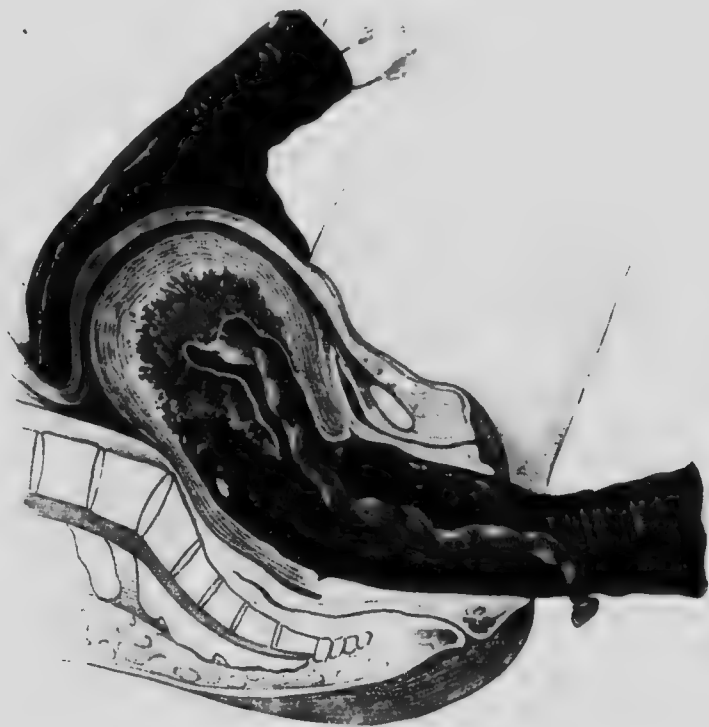


FIG. 140.—Manual removal of an adherent placenta.

In retention of the placenta, due to other causes, massage the fundus, and attempt to express the placenta by the Dublin method (*v.* page 190). If this fails, the placenta must be removed manually. This operation, which used to be considered one of the most

dangerous in midwifery, owing to the risk of sepsis, is now performed with comparative safety if strict aseptic precautions are used. It is performed as follows:— Place the patient in the cross-bed position, thoroughly wash her external genitals, and empty the bladder. Always wear rubber gloves. Introduce the hand into the uterus, taking care to keep outside the membranes, and at the same applying counter-pressure with the other hand upon the fundus. Feel for the edge of the placenta, and with the tips of the fingers separate it from the uterus with a sawing motion (*v.* Fig. 140). Try to detach it all in one piece. When it is completely detached, seize it in the hand passed above it, and remove it. Introduce the hand again into the uterus to ascertain if any portions have been left behind. As soon as all the fragments have been removed, douche the uterus thoroughly, and put the patient back to bed. When the placenta is very densely adherent, it may be necessary to wear gloves, the tips of which have been cut off, so as to leave the ends of the fingers free. In such cases the fingers should be painted over with flexible collodion or "new skin" in order to lessen the risk of carrying infection into the uterus.

Avoid, if possible, giving an anæsthetic in these cases, as it may interfere with the subsequent contractions of the uterus. If it must be given, let the patient be fully under its influence before the hand is introduced into the uterus, as this proceeding sometimes causes a considerable amount of shock to the patient; and, if this shock occurs at a time when she is beginning to come under the influence of an anæsthetic, the tendency to cardiac syncope is very great.

CHAPTER XXIII.

CONTRACTED PELVIS.

Diameters of the Normal Pelvis—Varieties of Contracted Pelvis—The Common Forms of Contracted Pelvis—Other Forms of Contracted Pelvis—Diagnosis—Mechanism of Generally Contracted Pelvis—Mechanism of Flat Pelvis—Mechanism of Generally Contracted Flat Pelvis—Treatment—Table of Degrees of Contraction—Walcher's Position—Time at which to induce Premature Labour—Müller's Method.

THE pelvis is said to be contracted if any of its diameters is shorter than is normal. The normal diameters of the pelvic brim measure :—

| | | |
|-----------------------|-------|--------------------------|
| True conjugate | . . . | 4-4½ inches (10-11 cm.). |
| Oblique diameters (2) | . . . | 5 " (12.5 "). |
| Transverse diameter | . . . | 5½ " (13 "). |

The diameters of the pelvic outlet measure :—

| | | |
|---------------------------|---------|----------------------|
| Antero-posterior diameter | . . . | 3½ inches (9.5 cm.). |
| Transverse | " . . . | 4½ " (11 "). |

Varieties.—The different varieties of contracted pelvis can be classified as follows :—

I. Generally contracted pelvis.

(1) Generally contracted pelvis, *pelvis æqualiter justo-minor*.

(A) Non-rachitic.

(B) Rachitic.

(2) Dwarf pelvis.

II. Flattened pelvis.**(1) Flat pelvis.****(A) Non-rachitic.****(B) Rachitic.****(2) Generally contracted, flat pelvis.****(A) Non-rachitic.****(B) Rachitic.****(3) Pelvis of congenital dislocation of the hips.****III. Obliquely distorted pelvis.****(1) By spinal curvature — kypho-scoliotic pelvis.****(2) By imperfect or abolished use of one lower limb—coxalgic pelvis.****(3) By asymmetry of sacrum—unilateral synostotic pelvis (Naegele's pelvis).****IV. Transversely contracted pelvis.****(1) The bilateral synostotic pelvis (Robert's pelvis).****(2) The kyphotic pelvis.****V. Funnel-shaped pelvis.****VI. Compressed or triradiate pelvis.****(1) The rachitic triradiate pelvis.****(2) The osteomalacic triradiate pelvis.****VII. Spondylolisthetic pelvis.****VIII. Pelvis narrowed by tumours, exostoses, fractures.****IX. Split pelvis.****THE COMMON FORMS OF CONTRACTED PELVIS.**

The varieties of contracted pelvis which are most commonly met with in these countries, are included in Groups I and II in the foregoing classification, and are as follows :—

I. (1) (A) The generally contracted, non-rachitic pelvis.

II. (1) The flat pelvis, both rachitic and non-rachitic.

(2) (B) The generally contracted flat rachitic pelvis.

In discussing these varieties it is convenient to discuss also the rachitic generally contracted pelvis, the dwarf pelvis, the non-rachitic generally contracted flat pelvis, and the pelvis of congenital dislocation of the hips, as, both anatomically and in their effect upon labour, they resemble very closely the more common varieties. We shall, therefore, under the present heading discuss all the varieties included in Classe^e I and II.

I. The Generally Contracted Pelvis. — The principal characteristic of this group consists in the proportionate shortening of all the diameters of the pelvis. Its varieties are as follows:—

(1) The generally contracted pelvis (*pelvis æquabiliter justo-minor*).

(A) Non-rachitic.

(B) Rachitic.

(2) The dwarf pelvis.

(1) *The Generally Contracted Pelvis (pelvis æquabiliter justo-minor).*—The rachitic and the non-rachitic forms of this variety of pelvis so closely resemble one another that it is impossible to distinguish between them, unless the history of the patient or the presence of lesions in other parts of the body furnish evidence of rickets. Consequently, both varieties may be discussed together.

The generally contracted pelvis is most commonly found in women below the average size. It has also been occasionally observed in women of normal or even of large size, especially in those whose general form

approaches the masculine type. It presents the appearance of a normal female pelvis, in which all the diameters are diminished in length. This diminution is usually so proportioned that the diameters retain their normal relation to one another. Sometimes the shortening is more marked in one diameter than in another, most frequently in the true conjugate, and so

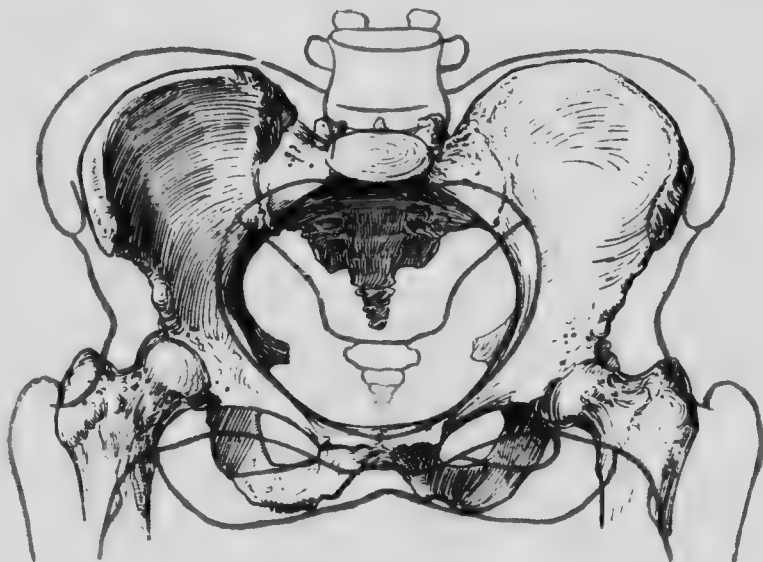


FIG. 141.—Generally contracted non-rachitic pelvis.¹ (Normal outline in red.)

produces a condition which approximates to the generally contracted flat pelvis, and which is usually the result of mild rickets (rachitic variety). Further evidence of this disease may possibly be found in extreme prominence of the ilio-pectineal lines.

The cause of contraction in non-rachitic cases is

¹ This and the other drawings of contracted pelvis are taken from the Author's 'Manual of Midwifery,' for which book they were specially made from the collection of the late Professor Milne Murray, of Edinburgh.

unknown, but the deformity has been ascribed to the carrying of heavy weights in childhood, thus throwing an excessive strain upon the pelvis, or to such general diseases as anæmia, which may produce a universal arrest of development.

The Dwarf Pelvis.—The dwarf pelvis, or *pelvis nana*, is most often the result of a severe type of rickets, or some similar disease of the bones, occurring either in foetal or in early extra-uterine life, and causing a general cessation of development of the body. It occurs in true dwarfs, in whom a cause for their small size cannot be detected. The bones are slight and may remain united by cartilage, and the contraction, as a rule, is extreme throughout the whole canal.

II. Flattened Pelvis.—This is the most common class of contracted pelvis met with. The principal feature is the shortening of the true conjugate, while the other diameters remain normal, or are slightly affected.

The varieties of flattened pelvis are as follows :

(1) Flat pelvis.

(A) Non-rachitic.

(B) Rachitic.

(2) Generally contracted flat pelvis.

(A) Non-rachitic.

(B) Rachitic.

(3) Pelvis of congenital dislocation of the hips.

(1) *The Flat Pelvis.*—The essential feature of both the non-rachitic and the rachitic varieties of flat pelvis is a diminution in the length of the true conjugate, unaccompanied by any diminution in the other diameters.

The flattened non-rachitic or simple flat pelvis is, except in minor degrees, only rarely met with. It is

generally believed to be produced by very severe work, involving much standing and the carrying of heavy weights during childhood, when the bones are in a plastic condition. It is also probable that some abnormal laxity or weakness of the posterior sacro-iliac ligaments is present, and permits of displacement of the sacrum. Such a relaxation may take place at the

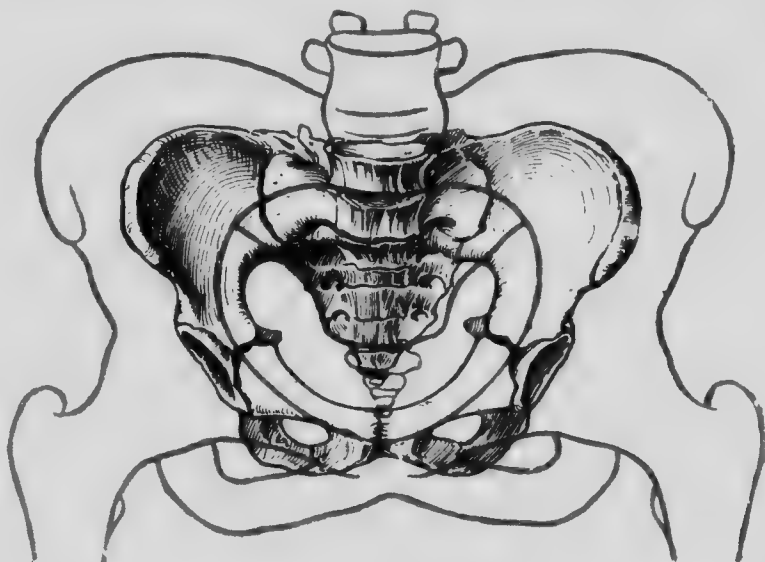


FIG. 142.—The dwarf pelvis.

period of puberty, as a result of anæmia and general debility, which in their severe forms lead to the lateral curvature of the spine so common at this age.

In this pelvis the sacrum is normal in shape, but it is displaced bodily downwards and forwards into the pelvis, and thus produces an antero-posterior contraction, which is slightly more marked at the inlet. In comparison with the conjugate, the transverse and oblique diameters are relatively lengthened. Sometimes

the transverse diameter is actually lengthened, but in the majority of cases it is slightly shortened. The whole pelvis, indeed, is often small. As a result of the sacral displacement, the posterior superior iliac spines approach more closely than normal to the middle line behind the sacrum, and thus constitute an important aid to the diagnosis of the condition.

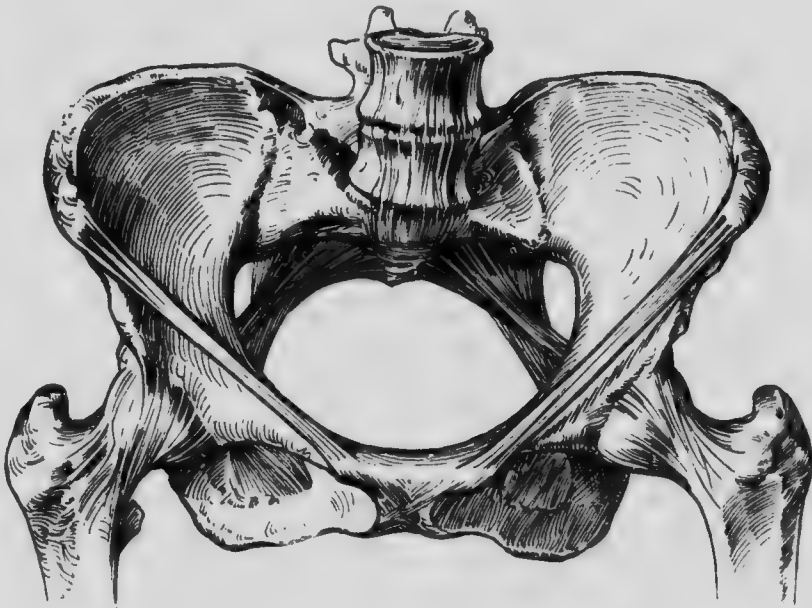


FIG. 143.—The rachitic flat pelvis. Minor degree.

The changes found in the rachitic variety of flattened pelvis are, for the most part, the direct results of the pressure of the body-weight acting downwards through the sacrum, and of the counter-pressure acting upwards and inwards through the heads of the femora, upon bones which have become softened and atrophic from rickets. The degree of flattening and general deformity depends upon the duration and severity of the rickets.

In infants, the body-weight is responsible for the greater part of the deformity, since the disease usually sets in before walking or standing is attempted, and having once set in, prevents both walking and standing. For this reason there is but little counter-pressure against the acetabula.

The sacrum is sunk deeply between the iliac bones, being displaced forwards and downwards by the body-

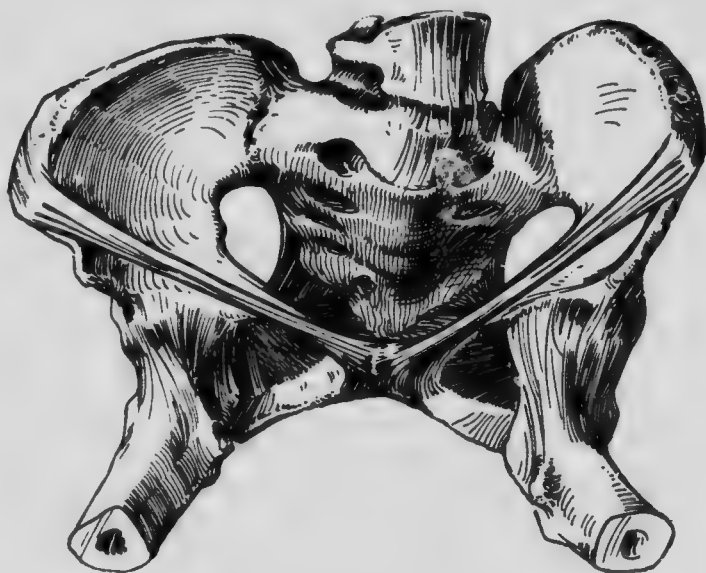


FIG. 144.—The rachitic flat pelvis. Extreme degree.

weight, and is at the same time rotated forwards on its transverse axis, so that the sacral promontory projects, causing great shortening of the true conjugate, and often giving the inlet a reniform outline. The general rotation of the sacrum prevents the lower part from causing an obstruction at the outlet. The normal transverse curvature is absent, and the front of the bone is flat, or even slightly convex from side to side. The transverse diameter of the brim is increased rela-

tively to the conjugate, but, in many pelves, though relatively increased, it is actually diminished, as a result of the general mal-development produced by the rickets. The pubic arch also is greatly widened. The conjugate diameter, which is much shortened at the inlet, is considerably increased in length below the brim, on account of the curvature and position of the sacrum. At the outlet it again undergoes some diminution, but not to any marked extent, and this diameter may be even longer than in the normal pelvis. The ischial tuberosities are widely separated, and the transverse diameter is, therefore, widened at the outlet.

The general result of these changes is to produce a pelvis flattened at the brim, and increasing in capacity from above downwards in both the conjugate and transverse directions. In the false pelvis the iliac fossæ are flatter and more vertical than normal, and look almost directly forwards. The curvature of the iliac crests is diminished, and the anterior superior iliac spines are directed rather outwards than forwards, so that the distance between them is as great, or even greater, than between any other corresponding points on the crests. In consequence of the position of the sacrum the posterior iliac spines approach one another closely.

(2) *The Generally Contracted Flat Pelvis.*—The essential feature of the generally contracted flat pelvis is contraction of all the diameters of the brim, especially marked in the true conjugate, which is diminished out of proportion to the other diameters.

The non-rachitic generally contracted flat pelvis is rarer than the rachitic form. It resembles a just-minor pelvis in which the sacrum has sunk into the pelvic cavity, with consequent diminution of the conjugate diameter out of proportion to the other diameters.

It is probably the result of causes similar to those which produce a justo-minor pelvis, and can be distinguished from the rachitic variety by the absence of deformity of the sacrum.

The rachitic generally contracted flat pelvis is comparatively common, but does not require any lengthy description, because it is almost identical in appearance with the flat rachitic pelvis, except that there is more

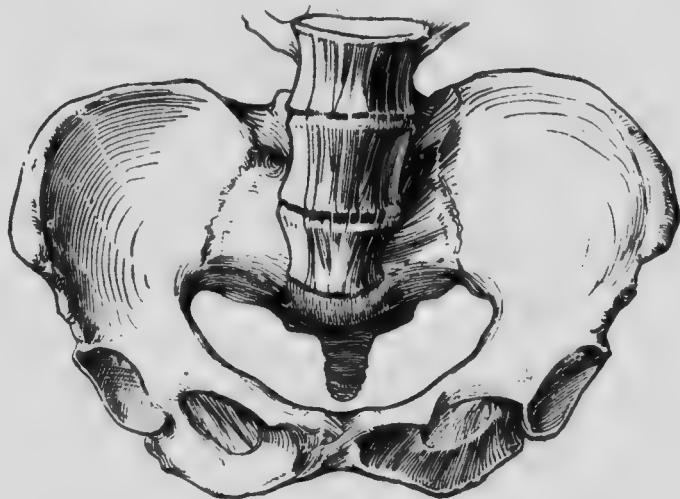


FIG. 145.—The rachitic generally contracted flat pelvis.

general contraction. It is the result of rickets of a more severe type than that which leads to the flat rachitic pelvis, and which is responsible not only for the flattening, but also for the pronounced arrest of development of the bones. The sacrum is deformed and displaced, and the bones are characteristically rickety. It is, as would be expected, most commonly found in small women.

(3) *The Pelvis of Congenital Dislocation of the Hips.*
—The form of pelvis, met with in double congenital

dislocation of the hips, is one which, from a developmental point of view, is of extreme interest, although it gives rise to only slight difficulty during labour. It is a rare form of pelvic contraction.

In cases of congenital dislocation of the hips, the heads of the femora most commonly articulate with the dorsum ilii above and behind the region of the acetabula, and at the same time are placed farther apart than is normal. The promontory of the sacrum is depressed,

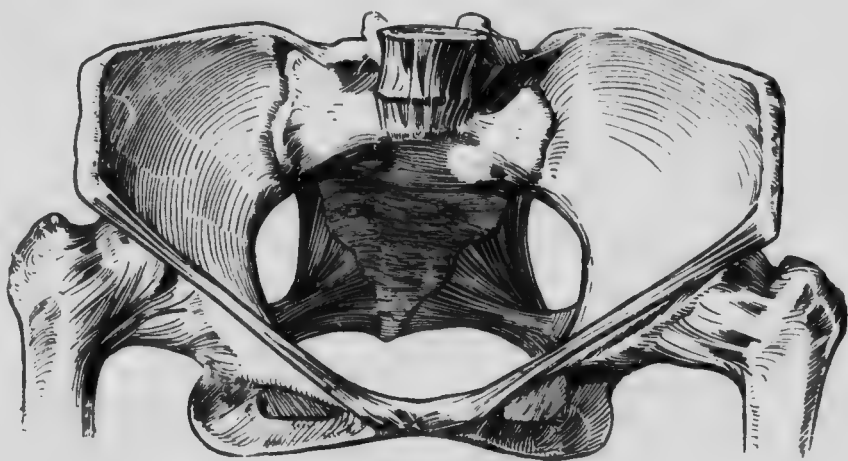


FIG. 146.—The pelvis of congenital dislocation of the hips.

and consequently there is a moderate degree of flattening at the brim. The vertical curvature of the sacrum is somewhat increased, and the coccyx projects downwards into the pelvis, but, since it is at the same time rotated upwards, the conjugate diameter of the outlet is not diminished in length, and even may be increased.

There is a slight increase of the transverse diameter at the inlet. The transverse diameter of the outlet is also widened, but in a more marked degree, the ischial tuberosities being pulled forwards and outwards by the

muscles attached to them, while at the same time the sub-pubic angle is enlarged.

OTHER FORMS OF CONTRACTED PELVIS.

The remaining forms of contracted pelvis are very rarely met with in these countries.

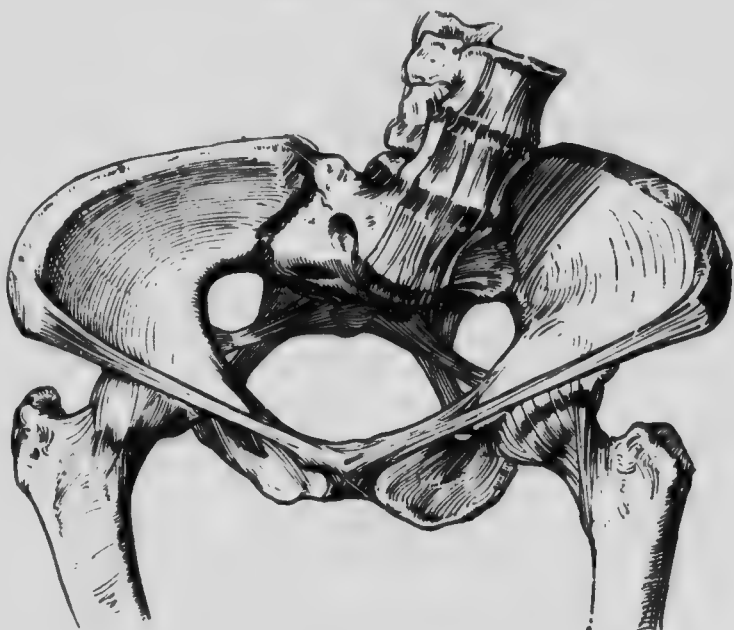


FIG. 147.—The kypho-scoliotic obliquely distorted pelvis.

III. Obliquely Distorted Pelvis.—Oblique distortion of the pelvis consists in the deviation of a part or the whole of the pelvis, towards one or other side, in such a manner that a marked difference results in the respective lengths of the oblique diameters. This distortion may be due to:—

(1) *Spinal curvature.*—*The kypho-scoliotic pelvis.*—The commonest cause of this form of pelvis is rachitic scoliosis, involving the lumbar region. The sacrum

deviates, and the pelvis is also distorted to the opposite side to that to which the lumbar vertebræ are deflected. The oblique diameter on the same side as the lumbar deflection is longer than its fellow (Fig. 147).

(2) *Imperfect or abolished use of one limb.*—*The coxalgic pelvis.*—The usual causes of this form of pelvis are unilateral coxalgia, amputation or old dislocation

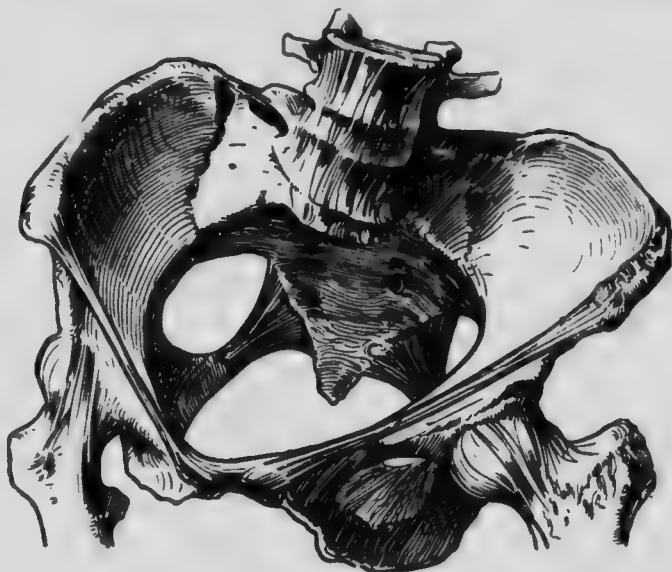


FIG. 148.—The coxalgic obliquely distorted pelvis.

of one lower limb, or comminuted fracture of one ilium. The healthy side of the pelvis is narrowed and flattened, the diseased side dilated and hollowed out. This oblique narrowing may extend to the outlet. The pelvis is distorted towards the affected side, and the oblique diameter of the opposite side is the longer (Fig. 148).

(3) *Asymmetry of the sacrum.*—*Naegle's pelvis.*—This condition may be caused by unilateral disease or fracture in the region of either sacro-iliac joint, or by

failure of development of the sacral ala on one side. The pelvis is distorted towards the healthy side. The oblique diameter of the same side as the lesion is the longer (Fig. 149).

These three forms of oblique pelvis all differ more or less from one another, but in all three the following defects can be noticed :—

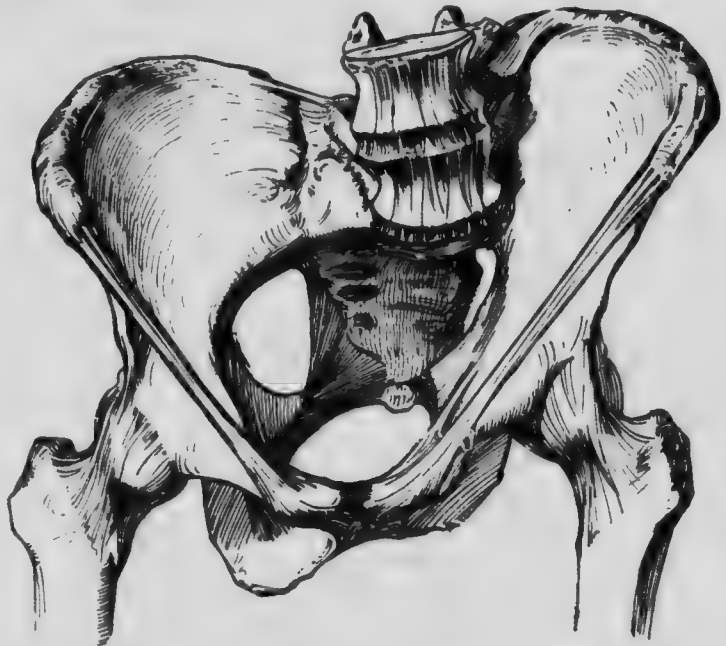


FIG. 149.—The unilateral synostotic obliquely distorted pelvis. Naegele's pelvis.

- (1) One oblique diameter is shorter than the other.
- (2) The conjugate diameter deviates from the middle line.

(3) The ala of the sacrum on the side of greater pressure is imperfectly developed, and the curvature of the os innominatum on the same side is diminished, while the curvature of the other os innominatum is increased.

(4) The pelvic cavity is divisible into a narrow part, towards which the sacral promontory is directed, and into a wide part, bounded in front by the symphysis pubis.

IV. Transversely Contracted Pelvis.—A transversely contracted pelvis is one in which, as the name

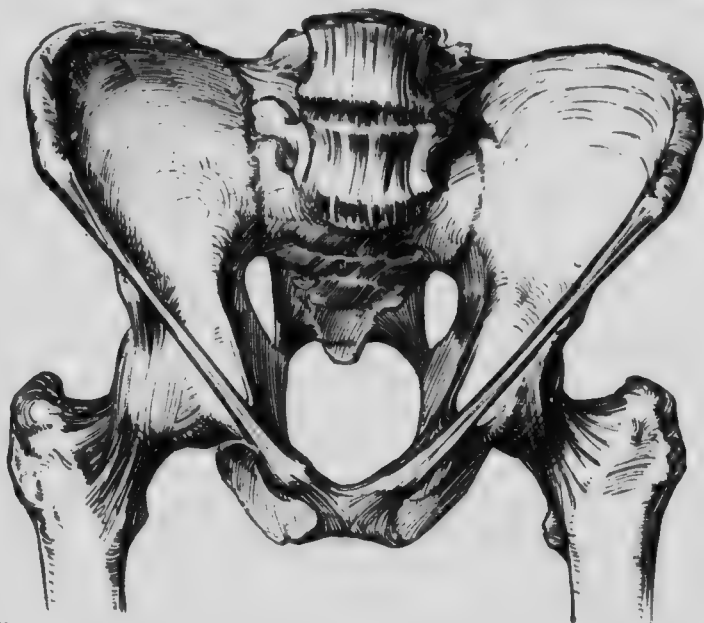


FIG. 150.—The bilateral synostotic transversely contracted pelvis.
Robert's pelvis.

shows, the transverse diameters are narrowed, while at the same time there is usually some compensatory elongation of the antero-posterior diameters. Two forms of this variety of pelvis are met with :—

- (1) The bilateral synostotic or Robert's pelvis.
- (2) The kyphotic pelvis.

(1) *Robert's pelvis*.—Robert's pelvis consists in symmetrical narrowing of the pelvis with compensatory

antero-posterior elongation. The condition is caused by synostosis of both sacro-iliac joints, with practical absence of the sacral alae (Fig. 150).

(2) *The kyphotic pelvis.*—The kyphotic pelvis is sometimes classified as a funnel-shaped pelvis. As, however, the transverse narrowing is well marked,

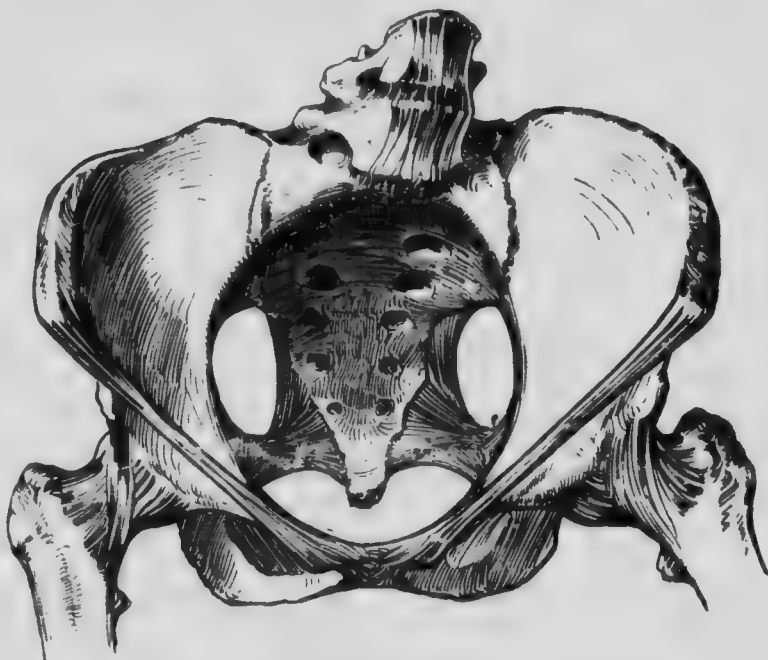


FIG. 151.—The kyphotic transversely contracted pelvis.

and as the term "funnel-shaped pelvis" is usually applied to a special form of pelvis unconnected with any spinal lesion, we prefer to include the kyphotic pelvis in the present group. If the kyphosis is situated in the dorso-lumbar region of the spine, transverse contraction (Fig. 151) of the pelvis is the chief characteristic; if it is situated in the lumbo-sacral region, the funnel shape of the pelvis is more

marked. As a result of the kyphosis the promontory of the sacrum moves backwards, while the tip moves forwards. The result of this is an increase in the true conjugate, and a decrease in the transverse diameters of the brim, and in all the diameters of the outlet.

V. Funnel-shaped Pelvis.—By a funnel-shaped

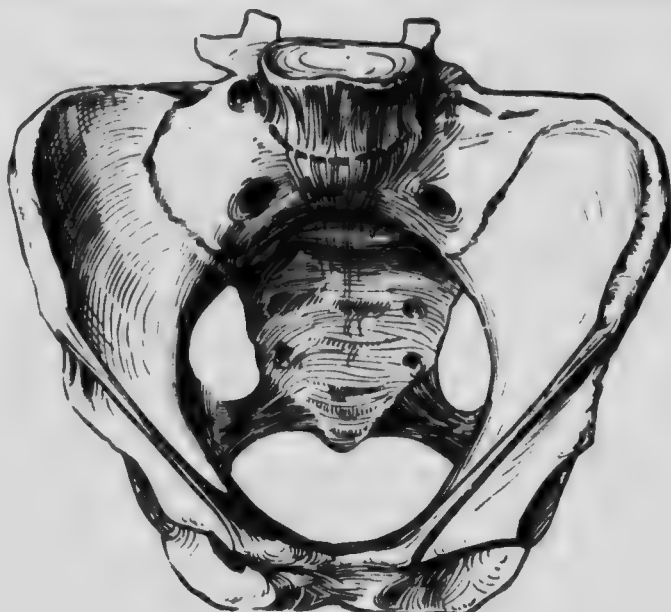


FIG. 152.—The funnel-shaped pelvis.

pelvis is meant a pelvis, not associated with any change in the spinal column, whose internal diameters diminish from the inlet to the outlet (Herman) (*v.* Fig. 152). It is an extremely rare condition, and its aetiology is unknown.

VI. Compressed Pelvis.—Two varieties of compressed triradiate pelvis are met with :—

- (1) The osteo-malacic triradiate pelvis.
- (2) The rachitic triradiate pelvis.

(1) *The osteo-malacic triradiate pelvis.*—This pelvis is the result of a disease of the bones which is excessively rare in this country, but which is found with considerable frequency in certain parts of Europe, and is known as osteo-malacia. This disease appears to be in some way definitely related to pregnancy. Indeed, it most often appears first during the period of gestation,

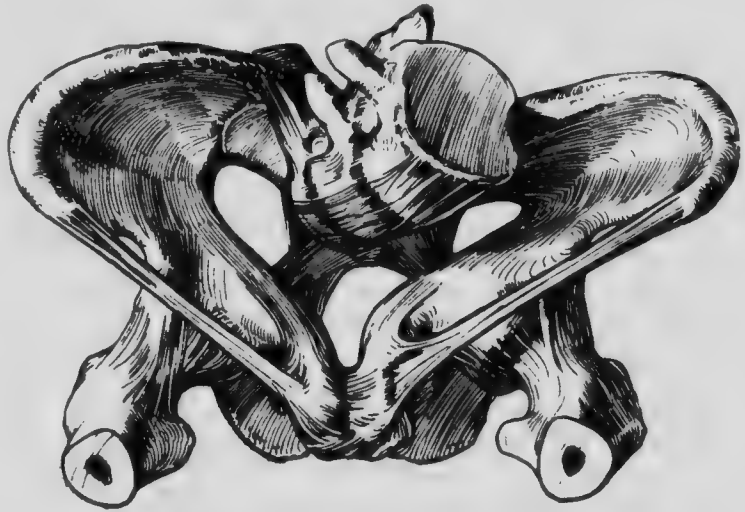


FIG. 153.—The osteo-malacic triradiate pelvis.

and lasts till the puerperium, when, if the patient does not suckle her infant, slight recovery may set in till the onset of the next pregnancy, at the beginning of which there is again, as a rule, a marked increase in the disease.

The essential pathological factor met with in the disease is a chronic rarefying myelitis and osteitis, which cause a gradual absorption of the bony trabeculae in the cancellous parts. The trabeculae are at first replaced by a form of osteoid tissue, devoid of calcium salts, but,

later, they become infiltrated with a vascular granulation tissue chiefly composed of small round cells, and completely disappear, so that on cutting into the bone it appears to be entirely composed of a semi-solid and reddish pulp. The medullary canals of the long bones become enlarged, and the compact tissue is also in great part absorbed, the process of absorption beginning around the vessels in the Haversian canals and gradually extending. In advanced cases, the bones become quite flexible, and can readily be indented by slight pressure. Sometimes the bones are universally attacked, but, in pregnant women, the disease is often most marked in the pelvis and the vertebral column. The changes which take place in the shape of the pelvis are the result of the pressure and counter-pressure, of the body-weight, both in sitting and standing, acting upon abnormally softened bones, and to these forces must be added the influence of muscular contraction.

The first changes to appear are due to the pressure of the heads of the femora, which, as the bone softens, tends to drive the acetabular region upwards, backwards, and inwards. Ultimately the two acetabula may come so close as almost to touch one another, only a narrow crevice being left between them. This leads anteriorly into a slit-like recess, bounded in front by the symphysis and on each side by the bodies of the pubic bones, which have become so sharply bent close to the symphysis as to be parallel with one another and almost to lie in the sagittal plane. They thus form a marked rostrum or beak at the front of the pelvis.

At the same time, the pressure upon the base of the sacrum has gradually driven this bone downwards and forwards towards the centre of the pelvis, and has bent the bone upon itself so that its vertical curvature is increased and the promontory forms a very marked

projection at the inlet. This projection, together with the projection formed by the backs of the displaced acetabula, give to the inlet the characteristic triradiate appearance.

The outlet of the pelvis is also transversely contracted by the inward movement of the bodies of the ischia, and the effects of sitting and lying greatly increase this

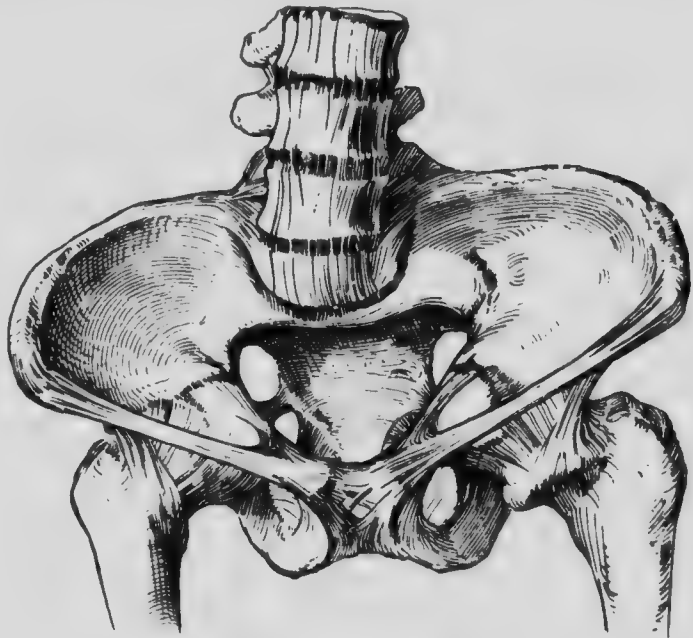


FIG. 154.—The rachitic triradiate pelvis.

contraction, so that the tubera ischii may come in contact with one another.

(2) *The rachitic triradiate pelvis.*—This pelvis very closely resembles the osteo-malacic pelvis, and is the result of very similar conditions. It is caused by a severe attack of rickets occurring at some period after the child has begun to walk, and when the pressure of the femora is enabled to exert its full influence in producing

distortion. The more advanced degrees of deformity are produced, as in true osteo-malacia, by pressure upon the outlet during the later stages of the disease, when confinement to bed becomes necessary. As recovery from the rickets takes place, the bones rapidly harden and render permanent the triradiate appearance.

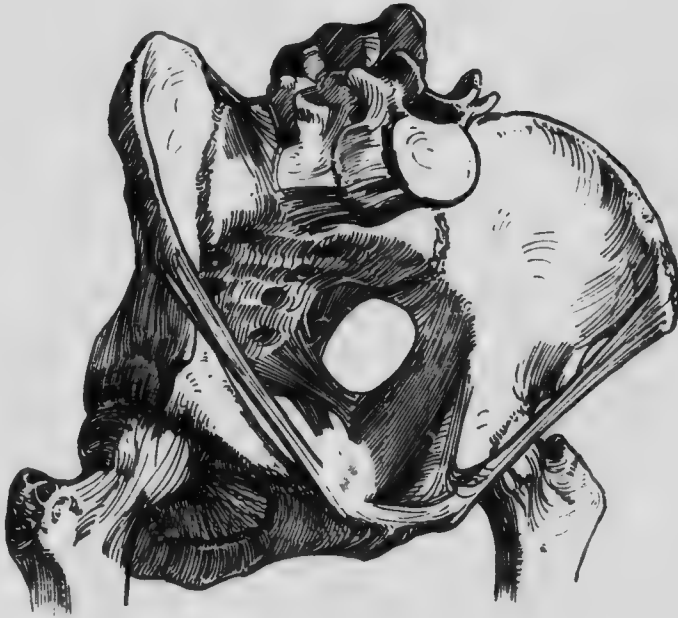


FIG. 155.—The spondylolisthetic pelvis.

VII. Spondylolisthetic Pelvis. — The spondylolisthetic pelvis (σπόνδυλος, a vertebra, and ὀλίσθησις, a slipping) is due to the displacement of the fifth lumbar vertebra forwards and downwards, so that its inferior surface is in contact with the anterior surface of the first sacral vertebra, to which it becomes synostosed. At the same time the arch of the lumbar vertebra remains in its old position, held by its inferior processes. The condition is due to the slipping forwards

of the lumbar vertebra when the bony parts are still soft enough to allow the lateral inter-articular processes to stretch, and may be caused by inflammatory conditions or direct injury (Fig. 155).

VIII. Pelvis Narrowed by Tumours, Exostoses, Fractures.—Narrowing of the pelvis may be caused by osteomata, enchondromata, fibromata, sarcomata, car-

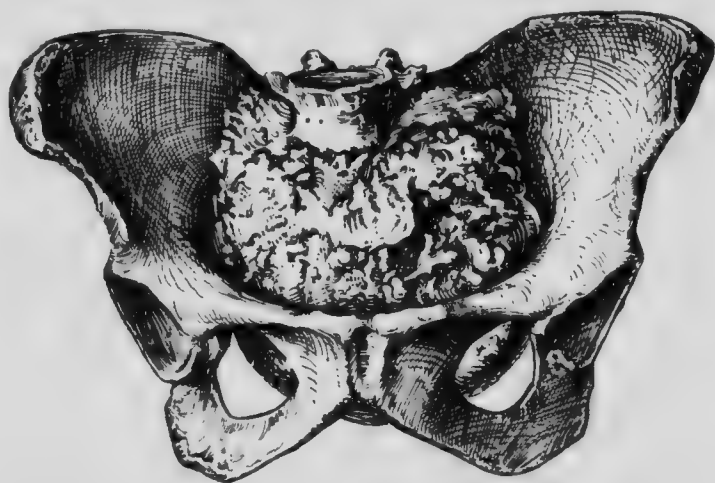


FIG. 156.—Pelvis narrowed by osseous tumour springing from the sacrum.

cinomata; by exostoses the result of inflammatory changes; and by fracture and dislocation (*v.* Fig. 156).

IX. The Split Pelvis.—A fissured or ununited pelvis is the result of the non-union of the pubic bones at the symphysis (*v.* Fig. 157). It is usually associated with *ectopia vesicæ*.

Diagnosis.—The diagnosis of contracted pelvis is made from:—

- (A) The history,
- (B) The appearance, and

(c) The symptoms of the patient,

(d) The abdominal and pelvic examination.

(A) **History.**—The history of the patient should be obtained :—

(1) As regards her childhood ; to ascertain if there is any evidence of early rickets, such as late dentition,

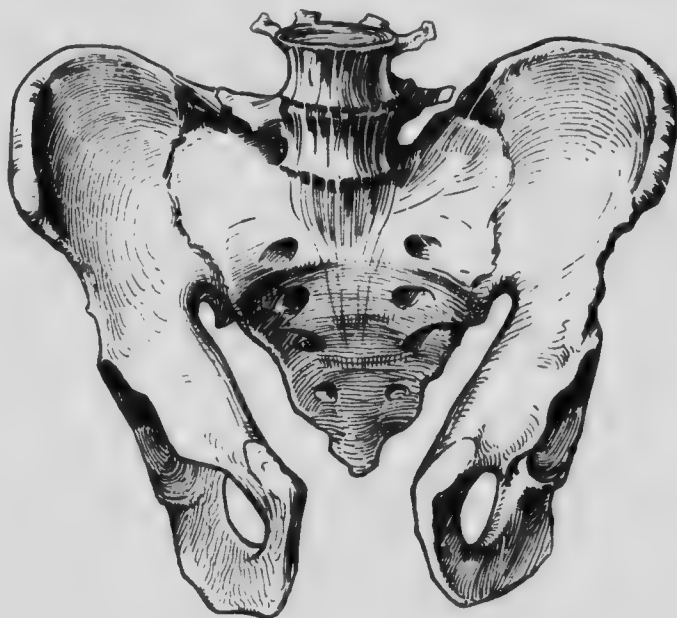


FIG. 157.—The split pelvis.

inability to walk at the proper age, a temporary loss of the power of walking.

(2) As regards her previous labours ; to ascertain whether they have been difficult or easy, whether the children were born dead or alive.

(B) **Appearance.**—The appearance of the patient suggests contracted pelvis if any of the following conditions are present :—

(1) Very small stature.

(2) Pendulous abdomen.

- (3) Curvature of the spine:—Kyphosis, lordosis, or scoliosis, particularly when occurring in the lumbar region.
- (4) Crooked legs, legs of unequal length, prominence of or impaired mobility in one hip.
- (5) Other evidence of rickets.

(c) **Symptoms.**—The symptoms of the patient during pregnancy and labour are of great importance. A contracted pelvis may begin to cause trouble in the early months of pregnancy, as by the fundus of a retroflexed uterus becoming incarcerated beneath the overhanging promontory (*v.* page 291). In the later months, the uterus and the presenting part of the fetus are pushed up out of the pelvis by the narrow brim, and, consequently, the fundus falls forward against the abdominal wall. A pendulous abdomen is thus produced, and malpresentations of the child are common, as has been explained before (*v.* page 289).

When the patient comes into labour, the effects of contracted pelvis are more manifest and important than during pregnancy.

Even in slight degrees of contraction, the head does not fix as early in labour as is usual, while, in the greater degrees, fixation may never occur. In the latter case, the uterine contractions increase in strength and endeavour to force the head through the brim, and failing in this, either die away completely—a condition of missed labour ensuing, or continue until rupture of the thinned lower uterine segment results. The presenting head is prevented from descending and filling the lower uterine segment, and the various consequences of its non-descent follow. The membranes protrude unduly into the vagina as a conical or sausage-shaped swelling, early rupture occurs, the liquor amnii escapes suddenly and completely, and the cord may be swept

down. A remoter consequence, due to the loss of the dilating action of the unruptured bag of membranes, consists in the slow dilatation of the uterine orifice. In some cases, the latter may dilate in the usual manner at the beginning of labour, as long as the membranes remain intact, but on their rupture dilatation ceases, or perhaps the cervix actually closes, to be again dilated by the presenting part.

In consequence of the early rupture of the membranes and the complete escape of the liquor amnii, the full force of the uterine contractions is directly exerted upon the fœtus, and the latter is subjected to a pressure which, if continued for sufficient time, causes its death. Also, the compression of the fœtal head by the narrow brim causes considerable deformity, and, in extreme cases, fracture of the cranial bones may result. The particular shape which the head takes as a result of this moulding depends on the particular variety of contracted pelvis.

If the lower uterine segment or the cervix is nipped between the descending head and the bony pelvis, it becomes œdematous, owing to obstruction to the return of blood through the veins. This condition, if at once relieved, is not of any great consequence, but, if allowed to persist, it may lead to serious results. First, it offers an additional obstruction to delivery, and may cause rupture of the lower uterine segment. Secondly, the anterior lip, or even the entire cervical ring, may be torn off by the descending head. Thirdly, the portion of cervical tissue which is nipped may slough, and a fistula result. Laceration and sloughing of the vagina may also occur after the head has passed the brim. Laceration may be the result of an extension of a cervical tear into the posterior fornix; and sloughing and the subsequent formation of fistulæ are due

to the compression of the vaginal wall between the presenting head and the bony pelvis. As a rule, such fistulæ form between the bladder and the vagina, but occasionally they form between the rectum and vagina.

During the puerperium, serious complications may result in consequence of the length of labour, the bruising and laceration of the soft parts, and the necessary intra-pelvic manipulations. Such complications are an increased tendency to post partum hæmorrhage, due to the long-continued labour and consequent exhaustion of the uterine muscle; an increased liability to sapræmic and septic infection, due to the lowered resistance of the bruised tissues, to the stagnation of liquor amnii in the vagina, and to the necessary intra-pelvic manipulations; and the formation of fistulæ, due to the nipping of the soft parts.

(D) **The Abdominal and Pelvic Examination.**—

Abdominal palpation often enables one to suspect the existence of a contracted pelvis, by showing the relation between the presenting part and the pelvic brim. If the head presents and is fixed, we know for certain that we are not dealing with a case of contraction of the brim, and, as this is the commonest site of contraction, it is *probable* that there is no contraction present. On the other hand, if the head is felt high above the brim and is movable at a time at which it ought to be fixed—*i. e.* during the last few weeks of pregnancy in primiparæ, and shortly after the beginning of labour in multiparæ, it is extremely probable that there is some degree of pelvic contraction. Several other conditions, however, also cause non-fixation, so that this condition must not be regarded as a certain proof of contraction.

Vaginal examination may at once reveal the presence

of pelvic contraction, as in cases of marked contraction of the outlet, or when we find a low promontory within easy reach of the finger, or an exostosis springing from the pelvic bones. A more careful examination of the sides of the pelvis may reveal flattening of one or both sides in an obliquely distorted pelvis, in Robert's pelvis, or in general contraction of the brim. During labour, information is obtained by abdominal palpation from the non-fixation and high situation of the presenting part, and by vaginal examination from the undue protrusion of the membranes into the vagina during a contraction of the uterus.

If the history, the appearance, the symptoms, or the result of the foregoing examination suggest the possibility of pelvic contraction, we must in all cases resort to the final and conclusive method of making a diagnosis; that is to say, the pelvis must be measured. We have already described the different methods of pelvimetry (*v.* page 71), and here we shall only refer to its application.

Four measurements of value can be ascertained by external pelvimetry:—

(1) *The length of the external conjugate, i. e.* the distance between the upper margin of the symphysis externally, and the depression under the spinous process of the last lumbar vertebra.—It is normally about 8 inches (20 cm.) in length. If in any case it is found to be less than $6\frac{1}{4}$ inches (16 cm.), there is certainly some degree of contraction present.

(2) *The distance between the iliac spines and the iliac crests.*—The normal distance between the anterior superior spines of the ilia is $10\frac{1}{4}$ inches (26 cm.); between the summits of the iliac crests $11\frac{1}{2}$ inches (28·75 cm.). The distance between the posterior superior spines is normally $3\frac{7}{8}$ inches (9·5 cm.). Con-

siderable shortening of these distances points towards contracted pelvis.

(3) *The ratio of the distance between the anterior superior spines to the distance between the crests.*—The normal ratio of the distance between the spines, and the distance between the crests, is as $10\frac{1}{2}$ to $11\frac{1}{2}$. If the distance between the spines is either equal to or greater than the distance between the crests, it suggests that the case may be one of rachitic pelvis.

(4) *The length of the antero-posterior and the transverse diameters of the outlet.*—The antero-posterior diameter of the outlet normally measures $3\frac{1}{2}$ inches (9.5 cm.), and the transverse diameter $4\frac{1}{2}$ inches (11 cm.).

By internal pelvimetry we ascertain the actual length of the true conjugate and of the transverse diameter of the brim, and, consequently, the actual size of the latter. From these measurements, and from the measurements of the antero-posterior and the transverse diameters of the outlet, we learn the nature and the degree of any of the common forms of contraction. The information obtained may be stated as follows:—

(1) If both the conjugate and the transverse diameters of the brim are diminished, but still preserve their normal ratio to each other, we are dealing with a case of generally contracted pelvis. In such cases it is probable that there is also some narrowing of the outlet.

(2) If the conjugate diameter alone is diminished, we are dealing with a case of flat pelvis.

(3) If both conjugate and transverse diameters are diminished, but the conjugate is diminished out of proportion to the transverse, we are dealing with a case of generally contracted and flat pelvis.

(4) If the transverse diameter is much diminished

and the conjugate increased, we are dealing with a case of Robert's pelvis.

(5) If the transverse diameter of the outlet is much diminished and there is a marked increase in the conjugate of the brim, we are probably dealing with a kyphotic pelvis.

(6) If both antero-posterior and transverse diameters of the outlet are much diminished, without any noteworthy increase in the diameters of the brim, we are dealing with a funnel-shaped pelvis.

Mechanism.—When the pelvis is contracted, but the degree of contraction is not so great as to prevent the passage of the head, the mechanism of a vertex presentation differs considerably from the mechanism which occurs in the case of a normal pelvis. The mechanism also varies in the different forms of contracted pelvis.

Generally Contracted Pelvis.—The most important point in the mechanism of this variety of pelvis is that the normal flexion of the head is exaggerated; consequently, the small fontanelle lies relatively deeper in the pelvis than usual—posterior fontanelle presentation (*v.* page 218). With this exception, the mechanism is similar to that in a normal pelvis.

Flat Pelvis.—The head enters the brim with its sagittal suture lying in the transverse diameter of the brim. At first one parietal bone rests upon the symphysis, the other upon the promontory. As the uterus contracts, the head is pushed towards the side of the pelvis at which the occiput lies. This movement brings the bi-temporal diameter, instead of the bi-parietal diameter, into the conjugate, and also causes a certain amount of extension of the head, as the sinciput, being smaller than the occiput, descends more rapidly. As a

result of this, first, a diameter of $3\frac{1}{4}$ inches (9.4 cm.) is replaced by one of $3\frac{1}{8}$ inches (8 cm.), and, secondly, the anterior fontanelle lies lowest—*anterior fontanelle presentation* (*v.* page 216). The head then rotates round its antero-posterior axis in such a manner, that the sagittal suture approaches the promontory of the sacrum, and the anterior parietal bone lies lowest. This relation of the head to the brim is termed *anterior asynclitism*. If the degree of contraction is not too great to permit of the passage of the head through the brim, the mechanism described under *anterior asynclitism* occurs, and the head passes the brim (*v.* page 158). If the degree of contraction is too great, rotation of the head continues until the sagittal suture lies above the promontory of the sacrum and the ear presents.

Generally Contracted Flat Pelvis.—The mechanism in these cases is usually a combination of the mechanism that occurs in a generally contracted and in a flat pelvis. The head engages in the transverse diameter of the pelvis. Marked flexion occurs, so that a posterior fontanelle presentation results. *Anterior asynclitism* also occurs in consequence of the rotation backwards of the sagittal suture.

Treatment.—In dealing with the common forms of contracted pelvis, four degrees of contraction are recognised. These degrees are based on the length of the true conjugate, and, within the limits of each degree, special methods of effecting delivery are applicable. In fixing the limits of each degree the presence of contraction of the transverse diameter of the pelvis must also be taken into consideration, as any degree of contraction in the conjugate is manifestly less serious if the transverse diameter is of normal length, than is the same degree in association with transverse narrowing. Accord-

ingly, the limits of each degree as shown by the length of the true conjugate, must differ slightly according as we are dealing with a case of flattening alone, or of general contraction.

The various degrees of contraction and the treatment suitable to each may be classified as follows :—

| Degree. | Length of C.V. in flat pelvis. | Length of C.V. in generally contracted pelvis. | Treatment. |
|---------|--------------------------------|--|---|
| 1st | 4—3½ ins. (10—8 cm.) | 4—3½ ins. (10—9 cm.) | Prophylactic version; or leave to nature,—i. e. allow the head to mould through the brim. |
| 2nd | 3½—3 ins. (8—7½ cm.) | 3½—3 ins. (9—7½ cm.) | Premature labour; version; pubiotomy, or Cæsarean section; craniotomy. |
| 3rd | 2½—2½ ins. (7—5½ cm.) | 3—2½ ins. (7½—6 cm.) | Cæsarean section; craniotomy. |
| 4th | Below 2½ ins. (5½ cm.) | Below 2½ ins. (6 cm.) | Cæsarean section. |

(1) In the first degree of contracted pelvis there is a choice between prophylactic version, and leaving the head to mould. We do not include the application of the forceps while the head is above the brim as a mode of treatment. Its use is only advisable when the force and frequency of the uterine contractions are below the normal; otherwise, if the forceps will bring a head through a contracted brim, the contractions of the uterus will also bring it through, with less danger to mother and child. When we make up our mind to allow the contractions to mould the head through the brim, the only special assistance we can render is by placing the patient in the most suitable position. This, while the head is trying to pass through the brim, is Walcher's position (*v.* page 405). With this exception, we leave the case to nature, until signs of

danger to the mother or child appear. In such cases we may apply the forceps, on the supposition that the pelvic contraction may not be so great as we think, and while the head is being brought through the brim the patient should be placed in Walcher's position. If it fails, or if the child is already dead, we must perforate. It is, of course, obvious that, as soon as the head has passed the site of contraction, the forceps may be used without any hesitation if labour is still protracted, as the case has then ceased to be one of contracted pelvis as far as the treatment is concerned.

Prophylactic version consists in performing podalic version at the beginning of labour. This is done because the head moulds better when compressed from below upwards, *i. e.* as an after-coming head, than it does when compressed from above downwards, *i. e.* as a forecoming head. But, on the other hand, it must be remembered that, when the head comes first, it may take many hours to come through the brim without detriment to the child. When the head comes last, it must be brought through the brim in at most one minute, or the child will die of asphyxia. Prophylactic version is a valuable method of treatment in a flat pelvis; but in a generally contracted pelvis it is of little use, since the long transverse diameters of the pelvis, into which the long antero-posterior diameters of the head can be turned, are lacking. Further, as a general rule, it is found that, while in the hands of a skilled obstetrician prophylactic version in a flat pelvis may give better results than moulding, an unskilled obstetrician obtains better results by allowing the head to mould. While the head is passing through the brim, the patient should be placed in Walcher's position.

(2) For the second degree of pelvic contraction premature labour has up to recently been considered

the best treatment, but now it is being replaced by pubiotomy or Cæsarean section. The alternatives to it are prophylactic version, pubiotomy, or Cæsarean section. Version is perhaps the best treatment in a case of flat pelvis, if the patient is seen under conditions which do not favour operation. The objection to it is that, if we fail to deliver the after-coming head, we have substituted an operation which may be most difficult—*i. e.* perforation of the after-coming head for one that is comparatively easy—*i. e.* perforation of the head coming first. Pubiotomy or Cæsarean section is preferable in a generally contracted pelvis, or when there is no difficulty in carrying out operative treatment. The great advantage which pubiotomy possesses over Cæsarean section is that it will probably cause sufficient permanent increase in the size of the pelvis to allow the patient to deliver herself in subsequent labours. On the other hand, it is prone to cause vaginal lacerations especially in primiparæ. If none of the foregoing operations can be performed, craniotomy will be necessary.

(3) For the third degree of pelvic contraction Cæsarean section is the only treatment that will save the child. If it cannot be performed, craniotomy will be necessary.

(4) For the fourth degree of pelvic contraction, *i. e.* absolute pelvic contraction, Cæsarean section is the only advisable mode of delivery. Extraction of even a mutilated child is too dangerous an operation to be undertaken.

Walcher's Position.—Walcher's position is of considerable use in any case in which a slight temporary enlargement of the conjugate diameter of the brim is required. It consists in placing the patient in the dorsal position, with her hips so far over the edge of the bed that her legs hang freely down, without any

support. The lower portion of her body then rests upon the sacrum, and the weight of the unsupported lower limbs is transmitted through the ilio-femoral (Y-shaped) ligament to the pelvis. The movement, which the sacro-iliac joints allow, permits as much of the pelvis as is formed by the innominate bones to be



FIG. 158.—Walcher's position.

drawn downwards by the weight of the limbs, as if it was rotating round the sacro-iliac joints. In this way the symphysis comes to lie at a lower level than is usual, thereby increasing the true conjugate (*v.* Fig. 159). The average increase in the latter is from a third to half an inch (Walcher). The best way to obtain the advantage of the position is to place the patient across the bed, with her buttocks hanging slightly over the

side during the time the head is passing the brim. The feet should rest on a chair, and, during each contraction, the chair is removed and the legs allowed to hang down unsupported. As soon as the contraction passes off, the feet are replaced on a chair. In this

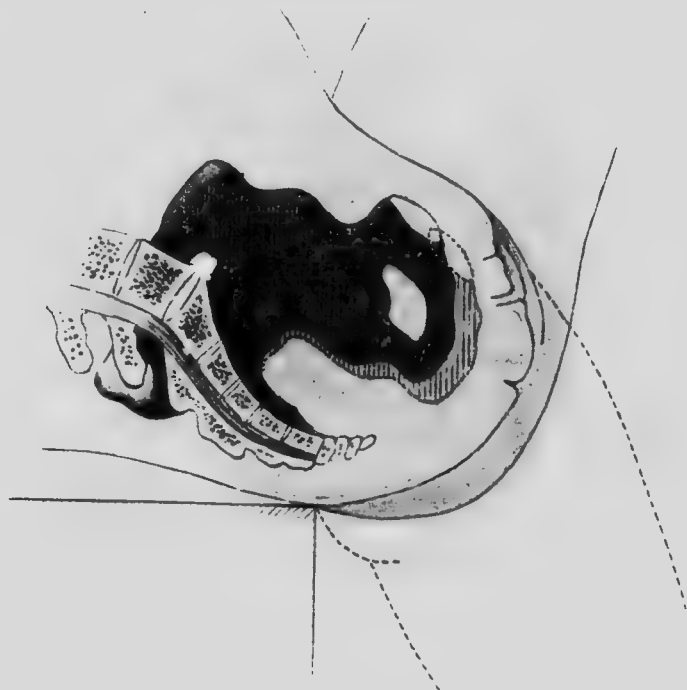


FIG. 159.—Diagram showing the increase in the C.V. brought about by Walcher's position. The dotted outline represents the new position of the pelvis, when dragged downwards by the weight of the limbs. (Slightly modified from Fothergill.)

way the extreme discomfort caused by any prolonged stay in Walcher's position is greatly lessened.

Premature Labour.—The correct time at which to induce premature labour, for the different degrees of pelvic contraction, is shown in the following table:—

| Conjugata Vera. | | Time to induce labour. |
|--------------------|--|---------------------------|
| 3 inches (7.5 cm.) | | 30th week |
| 31 " (8 cm.) | | 32nd " |
| 34 " (8.75 cm.) | | 36th " |



FIG. 160.—Müller's method of ascertaining the date at which to induce labour. O. O. Operator's hands. A. A. Assistant's hands.

This manner of ascertaining the date at which to induce labour is, however, open to two objections. In the first place, it is extremely difficult to be certain that we are correct in our calculations of the duration of pregnancy. In the next place, even if we can tell

the exact period of pregnancy, this table makes no allowance for the different sizes of children's heads.

Müller's method of ascertaining the date at which to induce labour is much more exact, and allows both for the degree of contraction of the pelvis, and for the size of the child's head. It is carried out as follows:—Place the patient in the cross-bed position, or upon a Schroeder's gynæcological chair. Introduce two fingers into the vagina, and palpate the presenting head. Then, grasp the head with the left hand, the fingers over the occiput and the thumb over the chin, or *vice versa*, according to the position of the fœtus, and press the head into the brim, while an assistant supplements this force by pressing down with both hands superimposed on the operator's hands as shown in the diagram (*v.* Fig. 160). If the head descends behind the symphysis, it is too soon to induce labour. This manipulation should be performed at intervals of a few days, until the day comes that the head cannot be forced through the brim. The first day on which this occurs is the day on which labour should be induced.

The treatment of the rarer forms of pelvic contraction will be found in the author's larger work on midwifery.

CHAPTER XXIV.

OBSTRUCTED DELIVERY.

Abnormalities on the part of the Mother : Contracted Pelvis—Tumours, of the Uterus, of the Vagina and Vulva, of the Pelvis, of the Ovaries—Stenosis and Atresia, of the Cervix, of the Vagina—Malformations of Uterus and Vagina—Malpositions of Uterus. Abnormalities on the part of the Fœtus : of Presentation, Position, Attitude—of Size -- Malformations and Tumours—Monsters.

It will perhaps be found of advantage to group the various causes of complete or partial mechanical obstruction to delivery in a single chapter, and to describe briefly those that are not mentioned elsewhere. The following table shows the various causes of such obstruction :—

Abnormalities on the part of the mother.

- (I) Contracted pelvis.
- (II) Tumours :—(A) of the uterus ; (B) of vagina and vulva ; (C) of the ovaries ; (D) of the pelvis.
- (III) Stenosis and atresia :—(1) of the cervix ; (2) of the vagina.
- (IV) Malformations of uterus and vagina.
- (V) Malposition of uterus.

Abnormalities on the part of the fœtus.

- (I) Presentation. Position. Attitude.
- (II) Size :—(A) of entire fœtus ; (B) of shoulders.
- (III) Malformations and tumours.
- (IV) Monsters.

ABNORMALITIES ON THE PART OF THE MOTHER.

I. CONTRACTED PELVIS.

Contracted pelvis has been already discussed (*v.* page 373).

II. TUMOURS OF THE UTERUS, ETC.

Tumours of the Uterus.—The tumours of the uterus which tend to interfere with delivery are fibromyomata and carcinoma of the cervix. The former cause trouble in one or more of the following ways:—

- (1) By weakening or mechanically interfering with the contractions of the uterus.
- (2) By offering an obstacle to the descent of the presenting part.
- (3) By causing malpresentation.

Carcinoma of the cervix obstructs labour not so much by its size as by the structural change in the cervical tissue preventing dilatation of the cervix.

Diagnosis.—Sub-peritoneal myomata lying above the pubes can be recognised during abdominal palpation, by noting the irregularity of the uterine surface. Interstitial myomata of any considerable size, if situated on the anterior uterine wall, can also be recognised by this method of examination, by noting that in one part of the uterus a resisting mass lies between the hand and the foetal parts, while elsewhere the parts can be readily palpated. Myomata of any considerable size springing from the lower part of the uterus and lying below the pelvic brim, can be recognised by vaginal examination, by finding a tumour projecting into the uterine cavity or embedded in the thickness of

the uterine wall, or even extending down beneath the vaginal mucous membrane, and interfering to a greater or lesser extent with the descent of the presenting part; while polypi, projecting from the cervix, will be found in the vagina. Carcinoma of the cervix can also be recognised during vaginal examination, by noting the condition of the cervix. According to the form of carcinoma present, the cervix will be ulcerated and partially destroyed, or enlarged and projecting in cauliflower-like masses into the vagina.

Treatment.—Pedunculated myomata, or myomata growing from the cervix, should be removed as soon as recognised. Both will most probably offer an obstruction to the descent of the presenting part, and polypi run a serious risk of sloughing after delivery owing to interference with their blood-supply. Myomata growing from the lower part of the body of the uterus will in many cases be drawn up during the last month of pregnancy, or during labour, by the retraction of the uterine muscle, particularly if they lie in the anterior uterine wall. If this does not occur, they must, if possible, be pushed above the presenting part. If they are evidently becoming impacted in the pelvis in such a manner as to offer a bar to the descent of the presenting part, and if they cannot be removed through the vagina, Cæsarean section must be performed, or craniotomy or embryotomy if the fœtus is dead and the myoma is of comparatively small size. If Cæsarean section is performed, it is often advisable to follow it by hysterectomy.

In cases of carcinoma of the cervix that are apparently operable, labour or abortion should be induced, and followed by hysterectomy as soon as possible after delivery. If the condition of the cervix will not allow delivery through it, Cæsarean section must be per-

formed, followed by hysterectomy if the growth can be removed. In a few instances, it may be possible to obtain the necessary amount of dilatation by means of hydrostatic dilators. Room may also be obtained by deep incisions of the cervix, extending from the uterine orifice to the vaginal vault, or even higher—after preliminary separation of the bladder from the uterus (Dührssen). The objection to this course is that it facilitates the generalisation of the growth, and that extensive laceration of the indurated tissue is also liable to occur. Consequently, this mode of dilatation ought only to be adopted when the condition of the patient, or the attendant circumstances, prevent the performance of Cæsarean section, and when the narrowing of the cervix is so great as to prevent the extraction of the child even after the performance of craniotomy or embryotomy.

Tumours of the Vagina and Vulva.—Apart from uterine polypi which have been extruded into the vagina, hæmatoma of the vulva or vagina and extensive œdema of the vulva are the most common forms of vaginal obstruction met with. Both conditions are referred to in other places (*v.* pages 220 and 447). Carcinoma of the vagina or vulva may also be met with. As a rule, it is not so extensive as to interfere with delivery, but, if it is, Cæsarean section must be performed. If the case is operable, the uterus should be emptied as soon as the condition is recognised, and total removal of the uterus and vagina performed.

Tumours of the Ovary.—Tumours of the ovary, unless of extreme size, do not interfere to any great extent with the course of labour, except when they become so impacted in the pelvis as to prevent the descent of the presenting part.

Diagnosis.—The diagnosis, in the case of ovarian tumours which lie above the brim of the pelvis, is made by abdominal palpation ; and, in the case of those lying in the pelvic cavity, by vaginal examination. They are distinguished from fibro-myomata of the uterus by determining the fact that they are separate from the uterus, and by the history of the patient.

Treatment.—If the tumour lies in the pelvis, an attempt is made to push it above the presenting part. If this succeeds, well and good. If not, and if we are dealing with a cystic tumour, it may be punctured with a trocar and cannula from the vagina, care being taken to ensure as perfect asepsis as possible. Even if the size of the tumour does not prevent delivery, it is well to evacuate the contents in all cases in which the tumour lies in the pelvis and cannot be pushed above the presenting part. Such a proceeding obviates the possibility of rupture during labour, but it must be followed as soon as possible by the removal of the tumour. Indeed, in hospital practice it is better to remove the latter as soon as it is diagnosed instead of puncturing it.

In the case of a solid tumour, which cannot be pushed out of the pelvis, ventral or vaginal cœliotomy must be performed and the tumour removed, if possible. If this is impossible, owing to its impaction in the pelvis, Cæsarean section should be performed first, and then the tumour removed. Craniotomy is only permissible when a cœliotomy is out of the question, and, indeed, in some cases its performance may be impossible owing to the position of the tumour.

In any case in which an ovarian tumour is present, and is not removed during labour, it ought to be removed as soon after as possible for fear of any necrotic or septic change taking place in it.

Tumours of the Pelvis.—The following tumours growing from the pelvic bones, are sometimes met with :—bony exostoses, enchondroma, fibroma, sarcoma, and carcinoma. According to their situation and size, they cause a varying degree of obstruction to delivery.

Diagnosis.—The diagnosis is made by vaginal examination. A tumour is felt, which is not connected with the uterus or appendages, but is connected with the pelvic wall. At the same time, its nature, *i.e.* bony or otherwise, its exact position, and the degree to which it encroaches upon the pelvic cavity must be determined.

Treatment.—The treatment depends on the degree of obstruction which the tumour causes. If the latter is not of large size, it may be possible to deliver the child past it, either by means of the forceps or by podalic version and traction on the legs. If neither of these methods can be adopted, Cæsarean section or craniotomy must be performed. If the narrowing caused by the tumour is so extreme as to prevent the passage of even a mutilated child, Cæsarean section is the only method of delivery.

III. STENOSIS AND ATRESIA OF THE GENITAL PASSAGES.

Stenosis and Atresia of the Cervix.—By the term stenosis of the cervix (*στενός*, narrow) is meant a narrowing of the cervical canal ; by the term atresia (*ἀ*, negative ; *τερεῖν*, I perforate) an imperforate condition.

Ætiology.—It is obvious that, as pregnancy has occurred, the cervical canal must have been perforate at the time of fertilisation. Consequently, we may

regard stenosis and atresia as merely different stages of the same condition. Atresia or stenosis of the os externum may occur in elderly primiparae as a result of increased rigidity of the muscle fibres of that part, with, in the case of atresia, the addition of an adhesive vaginitis or endocervicitis. Atresia, or stenosis of the vaginal portion may result, also in elderly primiparae from a diminution in the number of elastic fibres as a consequence of beginning senile atrophy. Stenosis affecting more or less the entire cervix may occur as a result of long-continued prolapse of the cervix outside the vagina, leading to hypertrophy of the cervical tissues; of a too extensive or badly performed Schroeder's amputation of the cervix; or, of extensive sloughing of the cervix, due to a former unduly prolonged labour, or to the improper use of caustics. Stenosis is also frequent result of carcinoma of the cervix.

Diagnosis.—Stenosis of the cervix is recognised on making a vaginal examination by finding it impossible to pass a finger into or through the cervical canal when, under normal circumstances, it should be possible to do so. Rigidity of the cervical tissues is diagnosed if the cervix in part or entirely fails to be taken up and dilated in the ordinary manner, in spite of the occurrence of strong labour pains. According to the extent of cervical tissue whose structure or elasticity is affected by the change, more or less of the cervix can be felt *per vaginam*, as a band of varying thickness which preserves the normal shape of the non-pregnant cervix.

Treatment.—The treatment to be adopted depends upon the cause of the condition. In cases of simple agglutination of the edges of the os externum, slight pressure with the finger or with the point of a uterine sound will probably succeed in re-opening the canal. If the cervix is rigid from change in its structure or

loss of elasticity, hot baths and frequent hot vaginal douches should be administered. If these fail, dilatation may be effected by Frommer's modification of Bossi's dilator, by multiple incisions of the cervix, or by hydrostatic dilators (*v.* page 497). The most suitable course of treatment is to begin dilatation, when the cervix is quite closed, with Frommer's dilator, and to continue with hydrostatic dilators, as their action is more gradual and less prone to cause laceration. When the tissue change is marked, multiple incisions will probably have to be made, or vaginal or abdominal section performed. The treatment proper to the various forms of the cervix has already been described (*v.* page 412).

Stenosis of the Vagina and Vulva. — Stenosis of the vagina or vulva may occur as the result of congenital malformation, of chronic ulceration, or of the presence of malignant disease.

Diagnosis.—There is no difficulty in making a diagnosis by inspection and vaginal examination.

Treatment.—If congenital bands, or slight degrees of cicatricial narrowing are present, division of the bands or deep incisions of the vaginal wall or perinæum, may enable delivery to occur. If, however, there is so considerable a degree of narrowing that the necessary space cannot be obtained in this manner, Cæsarean section or craniotomy must be performed.

IV. MALFORMATIONS OF THE UTERUS AND VAGINA.

The effects of malformations of the uterus and vagina on labour have already been described (*v.* page 293).

V. MALPOSITIONS OF THE UTERUS.

The effects of malpositions of the uterus on labour have also been already described (*v.* page 288).

ABNORMALITIES ON THE PART OF THE FŒTUS.

I. ABNORMALITIES OF PRESENTATION, POSITION, AND ATTITUDE.

PRESENTATIONS.—All presentations, save vertex and pelvic presentations, tend to offer a greater or less degree of obstruction to delivery. As they have been already described, it is unnecessary to refer to them again.

POSITIONS.—In vertex presentation, difficulties may occur during labour owing to the posterior rotation of the occiput. This condition is termed occipito-posterior position of the vertex, and has been already discussed (*v.* page 157). In pelvic presentation, the occiput of the after-coming head may rotate backwards into the hollow of the sacrum, and so give trouble (*v.* page 227). Lastly, in face presentation, the chin may rotate posteriorly, and similarly in brow presentation the face may rotate posteriorly, and increase to a very great extent the difficulties which always attend these presentations (*v.* pages 203 and 213).

ATTITUDE.—The normal attitude, which the fœtus assumes in the uterus, has been already described (*v.* page 41). Changes in the attitude of the head in cephalic presentation result in the production of face, brow, or anterior or posterior fontanelle presentation.

They have been already described. In certain cases, changes in the attitude of the limbs are met with, and may offer an obstruction to delivery. These changes are as follows :—

- (A) Prolapse of the hand or arm beside the head.
- (B) Nuchal position, *i.e.* dorsal displacement of the arm.
- (C) Prolapse of the hand and foot, or of hands and feet.
- (D) Prolapse of a hand or arm.
- (E) Prolapse of a foot or leg.

(A) Prolapse of a Hand or Arm beside the Head.

—In this condition one or other hand or arm is found in the pelvis accompanying a cephalic presentation (c. Fig. 161).

Frequency.—This condition is said to occur about once in 425 cases (Galabin), but it is probably rarer than this.

Ætiology.—Prolapse of the hand or arm is more likely to occur when the tone of the foetal tissues is impaired, as, for instance, in a dead foetus. It may also occur as the result of disproportion between the head and the pelvis—an unusually large pelvis, or an unusually small head; antero-posterior contraction of the pelvis; and sudden escape of a large quantity of liquor amnii, as in hydramnios.

Diagnosis.—The diagnosis of the condition is made on feeling the prolapsed limb by vaginal examination.

Treatment.—If the head is still free at the brim, the patient is placed on the side opposite to that at which the prolapse has occurred, as the resultant change in the inclination of the foetus may bring about the reposition of the arm. If it does not do so, the operator passes his hand into the vagina, and pushes

the arm above the greatest convexity of the head. If the arm is prolapsed and the head is impacted in the pelvis, delivery is left to the natural efforts, unless indications appear which necessitate its immediate completion. In these cases the forceps is applied, care being taken not to include the prolapsed limb between the blade and the head.

(B) **Nuchal Position of the Arm.**—Nuchal position, or dorsal displacement of the arm, is the term applied

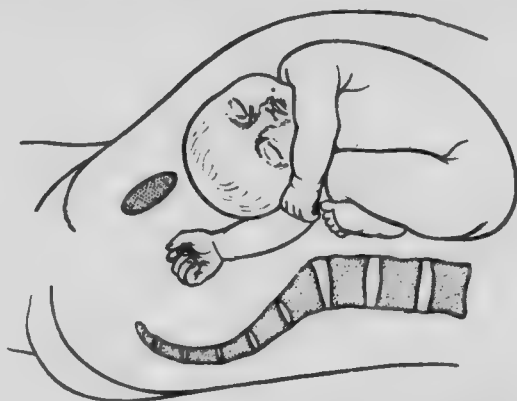


FIG. 161.—Prolapse of the hand beside the head.

to the attitude of the arm when displaced behind the neck of the fœtus.

Etiology.—Nuchal position of the arm may occur in either cephalic or pelvic presentations (*v.* Fig. 162). In the former it is difficult to account for its occurrence. In the latter it is sometimes the result of rotating the body of the child in such a direction that the friction of the pelvis tends to carry the arm behind the neck.

Diagnosis.—Nuchal position of the arm in a cephalic presentation probably will not be diagnosed until after the birth of the fœtus unless it causes an obstruction. Then, it may be determined by passing the fingers

above the head and feeling the arm lying behind the back. In the case of a pelvic presentation, the condition will be discovered when the hand is passed into the vagina in order to bring down the arms (*v.* page 232).

Treatment.—If the condition occurs in association with a head presentation, three modes of treatment have been suggested. The first of these is to endeavour to draw the arm down beside the anterior portion



FIG. 162.—Nuchal position of the arm in a pelvic presentation.

of the head (Simpson). The case then becomes one of prolapse of the hand with the head, and is treated accordingly. The second method consists in endeavouring to rotate the head, by grasping it with the fingers in the vagina, in such a direction that the friction of the pelvic wall will bring the arm forwards. It is probable that this will seldom be possible. The third mode of treatment consists in performing pelvic version, and while doing so replacing the arm.

The management of a nuchal position occurring in association with a pelvic presentation, has been already described (*v.* page 232).

(C) **Prolapse of a Hand and Foot.**—Prolapse of both hand and foot together is an occasional accompaniment of transverse presentations. Treatment consists in drawing down the foot and at the same time pushing up the head. As this is done, the arm will slip back into the uterus.

(D) **Prolapse of a Hand or Arm.**—This is also an accompaniment of a transverse presentation. Its occurrence is the rule in so-called "neglected shoulder presentation." Its treatment has been described (v. page 246).

(E) **Prolapse of a Foot or Leg.**—This is only another term for an incomplete pelvic presentation (v. page 220).

II. ABNORMALITIES OF SIZE.

The fœtus may offer an obstruction to delivery owing to its excessive size as a whole, or to the excessive size of the shoulders alone.

(A) **Excessive Size of the Entire Fœtus.**—This condition does not commonly prevent delivery, if the pelvis is normal. It will, however, make labour more tedious.

Diagnosis.—The diagnosis can rarely be made until after delivery. We may form an idea that the fœtus is of undue size by palpation and by noting the extent to which the cranial bones overlap, but it is difficult to be sure that we are correct.

Treatment.—The expulsion of the fœtus is left to the natural efforts as long as possible. If the symptoms of prolonged labour appear, the forceps is applied. If this fails, perforation must be performed.

(B) **Excessive Size of Shoulders.**—The shoulders may cause obstruction on account of their size both when the fœtus as a whole is larger than usual, and when there is no excessive size of the head.

Diagnosis.—The diagnosis of enlargement of the shoulders is made when external rotation of the head fails to occur. If the hand or fingers are then passed into the vagina, the obstructing shoulders can be felt blocking the pelvis.

Treatment.—If the shoulders do not follow the head, press firmly on the fundus in order to drive them down. If this fails, traction on the head may be made at the same time. If the shoulders still will not advance, place the patient in the cross-bed position, pass the fingers into the vagina and ascertain the position of the shoulders and back relative to the pelvis. Then, introduce the hand corresponding to the back, and hook one or two fingers into the posterior axilla and apply traction. If this still fails, introduce a couple of fingers of the other hand into the anterior axilla, and apply traction with both hands simultaneously.

If the shoulders still will not move, one or both arms must be brought down. To do this, pass the whole hand into the vagina, and a couple of fingers upwards along the posterior arm, until the elbow is reached. Then, by gentle pressure below the elbow the forearm is made to flex, and the hand can be seized and drawn out. The anterior arm is then brought down in a similar manner. By this means, the width of the chest is diminished by the thickness of the shoulders. Traction can now be made upon both arms and upon the head.

If, in spite of this, the thorax still does not follow, a hand must be passed into the uterus as far as is necessary, to determine the existence of any further com-

plication. If it is obvious that the size of the shoulders is causing the obstruction, and if all other means, short of embryotomy, fail, cleidotomy (division of the clavicles) may be performed (i. Chap. XXXIV). This can be done with a pair of stout scissors, and by enabling greater compression of the shoulders, effects a reduction of four centimetres or even more in the bisacromial circumference. It is also said not to be incompatible with the subsequent life of the child. At any rate, it is a more simple operation than is embryotomy. If cleidotomy fails, then embryotomy must be performed, and some of the viscera removed (evisceration).

III. MALFORMATIONS AND TUMOURS.

Malformations and tumours of any part of the foetal body may occur, and may be of sufficient size to interfere with the process of delivery. The following are those most frequently met with:—

(1) Hydrocephalus, the term applied to an accumulation of fluid in the cavity of the cranium.

(2) Hydromeningocele, a consequence of external hydrocephalus, in which a portion of the arachnoid membrane, distended with fluid, prolapses through a gap in the skull and forms a tumour on the cranium.

(3) Hydrancephalocoele, a consequence of internal hydrocephalus, in which, as a result of excessive accumulation of fluid in the ventricles, a sac formed of the meninges and of the brain itself, and, distended with cerebro-spinal fluid, is driven through a cleft in the cranium so as to form a tumour on the cranium. According to its position, the sac is distinguished as *hydrancephalocoele anterior, posterior, lateralis, superior, or inferior* (Winckel). It is much less common than the previous condition.

(4) Cystic hygroma of the neck, a cystic tumour which originates in degenerated lymphatic vessels. The tumour may be situated either in front or behind, and sometimes extends far down into the thorax. As a rule it is multilocular, but sometimes it is unilocular, although traces of previously existing septa can be found.

(5) Congenital cystic goitre (*struma cystica*) has sometimes been met with, as also congenital goitre due to hyperplasia of the gland.

(6) Hydrothorax—a collection of fluid in the pleural cavity.

(7) Tumours of the liver, spleen, and kidney occasionally occur of such a size as to obstruct delivery.

(8) Spina bifida, a cystic tumour filled with cerebro-spinal fluid, which forms over the spinal column and is due to the protrusion of the meninges of the cord through a fissure.

(9) Hydroperitoneum,—a collection of ascitic fluid in the peritoneal cavity.

(10) Hyper-distension of the bladder, due to impermeability of the urethra.

Diagnosis.—The diagnosis of the nature of these cases is made by abdominal palpation and vaginal examination, or sometimes by passing the hand above the presenting part into the uterine cavity. A hydrocephalic head is recognised on palpation—by its size, and on vaginal examination—by noting the separation of the cranial bones, the size of the fontanelles and the softness of the head. A hydromeningocele and a hydrencephalocele may be mistaken for unruptured membranes. A diagnosis is made by feeling the hair on the head, and by noting the thickness of the sac wall. A mistake in diagnosis is not of any great importance, as the hydromeningocele, if large, will have to be punctured if it does not burst. Tumours and cystic

conditions of the body of the fœtus, and the various forms of monster, will be recognised when they cause an obstruction to delivery, if the hand is passed into the uterus, and the fœtal parts are examined.

Treatment.—A hydrocephalic head, if it causes an obstruction—must be tapped through a suture. The natural efforts will then usually effect delivery. If delivery does not occur, the head is extracted by means of the forceps or a cranioclast, or version is performed. Cystic tumours must be punctured, if they cause an obstruction. Collections of fluid in the pleural or peritoneal cavity must also be punctured, or, if necessary, aspirated.

IV. MONSTERS.

It is impossible to describe here all the various so-called monsters which may occur. The following are the forms most commonly met with :—

(A) **Anencephalic Monster.**—In this form the cranium and brain are absent. The neck is short, and the shoulders are broader than usual. It is a condition commonly associated with hydramnios, spina bifida, and face or brow presentation.

(B) **Acardiac Monster.**—This is a condition which is met with in multiple pregnancy from the same ovum, in which one fœtus becomes a parasite and lives upon the other. The circulation of one twin may be stronger than that of the other, consequently it overpowers the weaker circulation, and thus a single heart carries on the circulation of both twins by means of an anastomosing circulation in the common placenta. The result is, that, while such tissues of the weaker fœtus as lie near the main branches of the umbilical vessels receive

sufficient blood to continue the development of a low form of tissue, the more distant tissues do not develop.

(c) **Double Monster.**—Double monsters are formed by the more or less complete union of twins developed from the same ovum. Obstetrically, they may be divided into two general groups:—Those in which one end of the fœtus is doubled, and those in which there are two outwardly distinct children united one to another more or less intimately.

In the former class are included cases of two heads (dicephalous), two faces (diprosopus), a double pelvis and lower limbs (dipygus), in which the rest of the body is single. In the latter class are included cases in which fusion takes place at some one place, the body above and below the site of fusion being double. These cases are divided into the following groups, according to the place at which union takes place:—

- (1) Cephalopagus monsters united at the head.
- (2) Thoracopagus monsters, united at the level of the thorax and abdomen.
- (3) Ischiopagus monsters, united at the level of the pelvis.

Diagnosis.—A suspicion of the presence of a double monster may be got from abdominal palpation. Usually, however, the presence of a monster is not recognised until it obstructs delivery. Then, on passing the hand into the uterus, the condition of affairs is discovered.

Treatment.—In monsters, the general rule is to bring down all the feet as soon as the condition is diagnosed. If delivery does not then result by the natural efforts, employ traction. If this fails, embryotomy will be necessary. Similarly, in cases of solid tumours of the fœtus, if traction either by the forceps or on the feet fails to deliver, embryotomy must be performed.

CHAPTER XXV.

PROLAPSE OF THE CORD.

Difference between Presentation and Prolapse of the Cord—*Ætiology*
—*Diagnosis*—*Treatment*: Reposition, Version, Forceps.

By the term presentation of the cord is meant that the cord lies in front of the presenting part, the membranes being unruptured. Prolapse of the cord is the term applied to the same condition after the membranes have ruptured.

Ætiology.—The commonest cause of presentation or prolapse of the cord may be stated, in general terms, to be any condition which interferes with the adaptation normally existing between the presenting part and the lower uterine segment. The chief of these conditions are :—

- (1) Contracted pelvis.
- (2) Malpresentations : — face, breech, transverse, and brow.
- (3) Hydramnios.
- (4) Twins.

In any of these conditions, the presenting part may not fill the lower uterine segment. Consequently, when the membranes rupture, the liquor amnii comes away with a rush, and may carry down a loop of the cord with it. Prolapse may also occur owing to :—

- (5) Low attachment of the placenta, *i. e.* placenta prævia.

- (6) An abnormally long cord.
- (7) Marginal insertion of the cord into the placenta, *i.e.* battledore placenta.

Diagnosis.—The diagnosis is obvious in prolapse of the cord. A loop of it can be felt in the vagina, or may even be seen protruding from the vulva. In presentation of the cord, its coils are felt in front of the

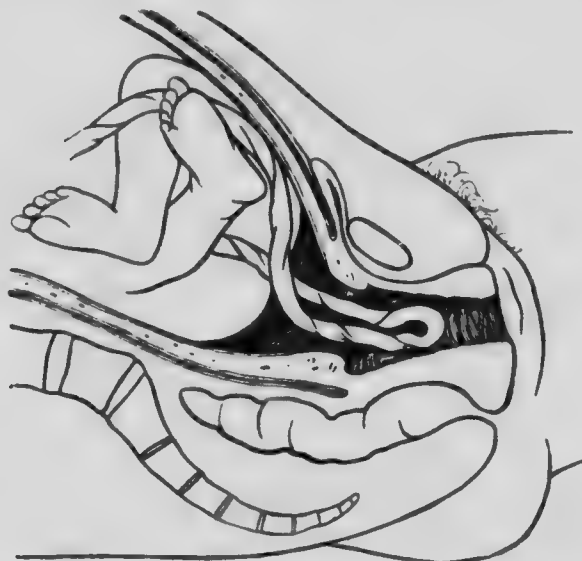


FIG. 163.—Prolapse of the umbilical cord into the vagina.

presenting part, and, if the child is alive, the cord pulsates.

Treatment.—There are three general methods of treatment, one of which must be adopted if the life of the child is to be saved :—

- (A) Reposition of the cord.
- (B) Substitution of a presentation which permits of the descent of the fœtus without pressure on the cord ; *i.e.* podalic version, with or without—

(C) Immediate delivery of the foetus.

If the cord is not pulsating when the condition is discovered, and if the foetal heart cannot be heard, the child is dead, and there is no need to interfere. One must always remember that the cord stops pulsating at least a minute before the death of the child; consequently, if we know that the pulsations have only just ceased, we should deliver at once, if possible, and not give the case up as hopeless.

(A) **Reposition.**—The manner of performing reposition varies with the conditions present. If it is a case of presentation of the cord, and the presenting part is not fixed, try the *postural treatment*. Place the patient in Trendelenburg's position, *i.e.* with the buttocks raised and the head low; the foetus will then tend to fall towards the fundus under the influence of gravitation, and the cord may do the same. Examine vaginally while the patient is still in the same position. If the cord has gone up, push the presenting part into the brim of the pelvis, rupture the membranes, and then allow the patient to lie down again. Keep the presenting part pressed into the brim until a contraction fixes it, or apply a tight abdominal binder with the same object. An extempore Trendelenburg's table can be made by placing an ordinary square kitchen chair on its face along the bed, and covering it with pillows in order to protect the patient. By this means, the body is placed on an inclined plane, which is just as efficacious and far more comfortable for the patient than the knee-chest position.

If this method does not succeed, or if the membranes are ruptured, an attempt must be made to replace the cord. This is an extremely difficult operation to perform, for, as fast as we replace one loop, another comes down. The patient should be placed under an anæ-

thetic, as any straining renders the operation impossible. Then, grasp the cord in the hand, carry it up past the presenting part, and endeavour to hang it over a limb. As the hand is withdrawn, press the presenting part down into the brim from above.

If the os is not sufficiently dilated to enable the hand to be introduced, or if we fail to replace the cord with the hand, a repositor of some kind may be used. The best form of repositor is made as follows:—Take a No. 10 or 12 gum-elastic catheter with a stilette. Knot together the ends of a piece of sterilised silk about seven inches in length. Pass any part of the loop thus

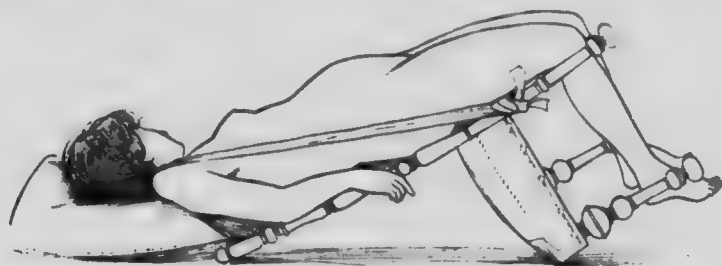


FIG. 164.—Trendelenburg's position.

formed through the eye of the catheter, and push the stilette up in such a way that it passes through the loop. The instrument is then ready. To use it, pass the loop of silk that hangs from the eye of the catheter round the prolapsed portion of the cord, and then throw the loop over the top of the catheter (*v.* Fig. 165). Pass the catheter upwards into the uterus until the cord is above the presenting part, and then withdraw the catheter gradually, at the same time pressing down the presenting part into the brim. So long as the catheter is pushed up, the loop cannot slip off the top of it; but, as soon as one begins to withdraw it, the loop slips off the top, and the cord is set free.

(B) **Podalic Version.**—If reposition fails, as is usually the case, and the head is presenting, turn the child into a breech presentation, and draw down a foot. By this manœuvre we obtain a presentation which is not so likely to press upon the cord as is a head presentation, inasmuch as the breech does not so completely fill the lower uterine segment. The case must be watched very carefully; and, if the cord stops pulsating, one must, if possible, extract the child at once. Version is performed by the internal or the bipolar method,

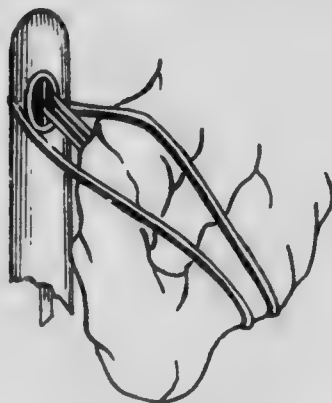


FIG. 165.—Catheter used as a repositor for the cord, showing the manner in which the string is adjusted.

according to the size of the os. In one point the method of performing version, in a case of prolapsed cord, differs from the usual method. The child should be turned by pushing the head in the direction of its abdomen, *i. e.* in the reverse of the ordinary direction. The object of this proceeding is to keep the umbilicus of the child as far away from the uterine orifice as possible, in order to prevent more cord from prolapsing.

(C) **Immediate Delivery.**—If the os is sufficiently dilated, podalic version may be followed by immediate delivery.

If version cannot be performed, *i. e.* if the head is fixed, the child must be extracted immediately by the forceps. If the os is sufficiently dilated, there will be no difficulty in the proceeding. If it is not dilated, it must be incised (*v.* page 497), and the forceps applied. Never drag the head through an os which is not sufficiently dilated to allow it to pass through without tearing, as a laceration once started may extend into the lateral fornix and open the uterine artery. If incisions are made, they must be sutured immediately after delivery.

While the necessary preparations are being made for any operation for prolapse of the cord, the patient should be placed on the side at which the cord lies. The reason for this proceeding has been explained (*v.* page 246). Also the patient should be told not to strain or "bear down."

CHAPTER XXVI.

POST PARTUM HÆMORRHAGE.

Primary Post Partum Hæmorrhage—Varieties—Traumatic Post Partum Hæmorrhage—Atonic Post Partum Hæmorrhage: Plugging with Iodoform Gauze, Injection of Perchloride of Iron—Concealed Hæmorrhage—Secondary Post Partum Hæmorrhage—Post-hæmorrhagic Collapse—Infusion of Saline Solution.

THE term post partum hæmorrhage is, for convenience sake, applied to any hæmorrhage which occurs after the birth of the child, irrespective of the fact that parturition may, or may not, be complete. It is divided into two classes, according to the time at which it occurs :—

- (I) Primary post partum hæmorrhage.
- (II) Secondary post partum hæmorrhage.

PRIMARY POST PARTUM HÆMORRHAGE.

Primary post partum hæmorrhage is the term applied to hæmorrhage occurring within six hours after delivery.

Frequency.—The relative frequency of post partum hæmorrhage depends on the amount of post partum bleeding which we consider to constitute hæmorrhage. In the Rotunda Hospital amongst 36,227 patients the relative frequency of hæmorrhage which required some treatment more energetic than massage of the fundus and the administration of ergot, was 1 in 65·63, *i.e.*

1.52 per cent. The great majority of these cases were cases of atonic hæmorrhage.

Varieties.—There are two varieties of primary post partum hæmorrhage :—

- (A) Traumatic post partum hæmorrhage.
- (B) Atonic post partum hæmorrhage.

(A) **Traumatic Post Partum Hæmorrhage.**—This is the term applied to hæmorrhage resulting from laceration of some part of the genital canal. There are two situations in which a laceration is likely to cause hæmorrhage, viz.—in the neighbourhood of the clitoris, or in the cervix.

Diagnosis.—The diagnosis has to be made from atonic post partum hæmorrhage, that is hæmorrhage due to the failure of the uterus to contract. This is easily accomplished by placing the hand on the fundus ; if the latter is firm and well contracted, the hæmorrhage cannot be due to the failure of the uterus to contract, *i.e.* it must be traumatic hæmorrhage. In some cases, the diagnosis may not be made until we have begun to douche the uterus. If a Bozemann's return catheter is used for this purpose, it at once distinguishes between the two conditions. In the case of hæmorrhage from the interior of the uterus, the solution which flows back through the return pipe of the catheter will be blood-stained. If the hæmorrhage comes from a laceration outside the uterus, the solution in the return pipe will be almost colourless, whilst at the same time blood is seen to flow from the vagina or vulva.

Treatment.—If traumatic hæmorrhage is suspected, examine the region of the clitoris. If there is a laceration which is bleeding, it must be stitched. To do this, pass a silk ligature by means of a small curved needle

deeply under one end of it, going right down to the bone, and a second ligature at the other end. Tie them tightly, and the hæmorrhage will cease. The ligatures must be removed in six or seven days. If, on inspection, no laceration can be detected about the clitoris, we must examine the cervix. To do this draw the latter down with a bullet forceps, if there is one to hand, and examine it carefully for a laceration or bleeding vessel. A laceration must be stitched, a bleeding vessel must be tied. If no bullet forceps is at hand, an equivalent can be extemporised by means of a piece of surgical silk. Thread a curved needle with a long piece of silk, and pass the needle, held in a needle-holder, up to the cervix under cover of the fingers in the vagina. Then pass the needle through the first part of the cervix that comes to hand, and draw it through, leaving the silk *in situ*. By this means, or, if necessary, by two or three pieces of silk so passed, the cervix can be drawn down and exposed. Pressure upon the fundus, by causing descent of the uterus, affords considerable assistance.

(1) **Atonic Post Partum Hæmorrhage.**—This condition is due to failure of the uterus to contract and retract. It may occur either as an external hæmorrhage, or as an internal or concealed hæmorrhage. The former is very much the more common. The latter is only possible under a radically bad management of the third stage.

Ætiology.—Before entering into the causes of atonic hæmorrhage, it is well to understand what it is that normally prevents the occurrence of hæmorrhage after the detachment of the placenta. This is brought about by three factors:—

(1) The contractions of the muscular coat of the uterus.

(2) The retraction of the muscle-fibres of the uterus.

(3) The clotting which occurs in the mouths of the vessels.

The difference between contraction and retraction has been already explained (*v.* page 112), and it has been mentioned that the former is intermittent, the latter continuous. The latter is therefore the more important. The third means by which hæmorrhage is checked is of little or no importance, *i. e.* the clotting of blood in the open mouths of the vessels. It is probably the result of the checking of the hæmorrhage, and not the cause of it. We may, then, attribute the permanent cessation of hæmorrhage after the detachment of the placenta to the retraction of the uterine fibres. Contraction of the uterus checks hæmorrhage during the period of contraction, but retraction, once established thoroughly, prevents the occurrence of any further hæmorrhage.

We can now understand the causes of atonic post partum hæmorrhage. Considered generally, they include anything which interferes with the due retraction of the uterine muscle-fibres. They are as follows:—

(1) Retained placental fragments, membranes, or blood-clots, *i. e.* bad management of the third stage of labour.

(2) Uterine inertia, which may in turn be due to such conditions as weak muscular development of the uterus, over-distension of the uterus as in hydramnios or twins, metritis, and protracted labour.

(3) Precipitate labour.

(4) Any condition which weakens the patient, as previous hæmorrhages and wasting diseases.

(5) Tumours of the uterus, as myomata.

(6) Placenta prævia.

Treatment.—The most important point, in the successful treatment of post partum hæmorrhage, is to have a definite plan of action laid out,—a plan which begins with the mildest measures, and goes gradually on to more serious measures, if necessary. The following is such a plan, in the order that should be adopted, and presupposing that the failure of each measure in turn requires the adoption of the subsequent one:—

(1) Ascertain whether the placenta is in the uterus or in the vagina. If it is in the uterus, stimulate the fundus to contract by gentle friction. If the bladder is distended pass a catheter. If the hæmorrhage still continues, or if the placenta is in the vagina at the beginning,

(2) Try to express the placenta by the Dublin method; if that cannot be done, wash the patient externally, douche the vagina with cyllin solution at a temperature of 100° — 120° F., and remove the placenta manually (*v.* page 371).

(3) Stimulate the fundus to contract by friction, and administer ergot. Up to one or two drachms of the liquid extract may be given, but more reliable are the hypodermic tabloids of citrate of ergotin, of which up to $\frac{1}{25}$ of a grain may be administered hypodermically.

(4) Wash the patient externally, and administer a hot vaginal douche, if this has not been already done.

(5) Douche the uterus thoroughly with cyllin solution.

(6) Compress the fundus firmly between the fingers of one hand in the anterior fornix and the other hand upon the abdominal wall, thus squeezing out any clots that may be retained. Then repeat the intra-uterine douche.

(7) Introduce the hand into the uterus, and remove any fragments of placenta or membranes and all clots that may be in it. Then repeat the intra-uterine douche.

(8) Plug the uterus with iodoform gauze. To do this seize the anterior lip with one bullet forceps and the posterior lip with another, and pass a posterior speculum if one is available. Then pass a long strip of iodoform gauze up to the fundus, by means of a plugging forceps (*v.* Fig. 166) or with the end of a Bozemann's catheter. The rest of the strip is then pushed into the uterus, taking care to pass it as far up towards the fundus as possible. If another strip has to be used, it must be knotted to the first strip in order to facilitate



FIG. 166.—Curved forceps for plugging the uterus.

extraction. It must be remembered that we have not to plug the large cavity of a dilated uterus, but only the comparatively small cavity of a contracted uterus; because, on the introduction of a small quantity of gauze, the uterus, which before was flaccid and relaxed, quickly contracts firmly upon the foreign body. A tight abdominal binder is then applied, in order to control the uterus from above, and the patient is put back to bed. The gauze is removed in twenty-four hours, and if there is any elevation of the temperature, the uterus thoroughly douched.

If we have not a bullet forceps or posterior speculum, the gauze may be carried up into the uterus with the fingers of one hand, the fundus being pushed down within reach with the other hand laid on the abdominal wall.

Compression of the aorta as a means of checking hæmorrhage has been recommended, and is undoubtedly of value if we have an assistant capable of performing it. It is of use while we are adopting local measures for checking the hæmorrhage, as it is at the uterus itself the bleeding must be finally checked.

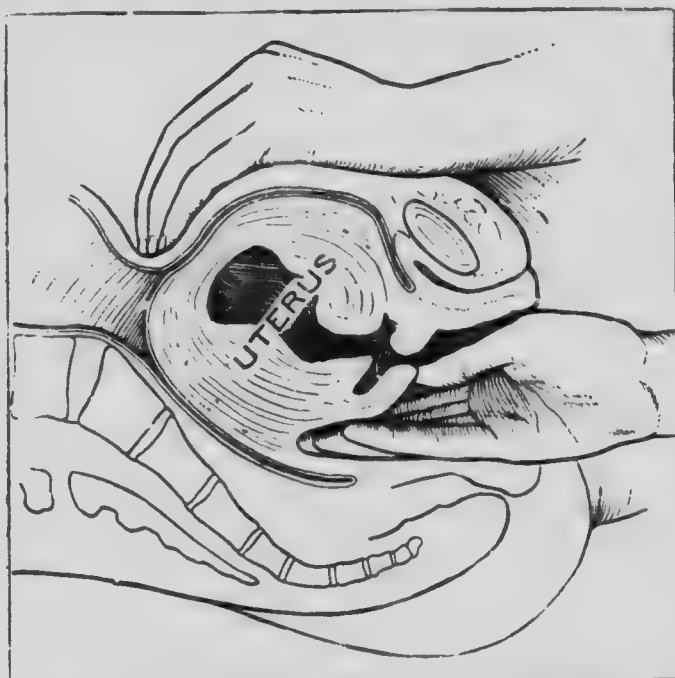


FIG. 167.—Diagram showing the method of compressing the uterus between the two hands, with the object of checking post partum hæmorrhage.

Another method of temporarily arresting hæmorrhage is the so-called "external tamponing" of the uterus. A wide binder is applied in the ordinary manner and pinned firmly in position. It must reach from below the trochanters to above the umbilicus. The space left between it and the abdominal wall is then plugged as tightly as possible with napkins, handkerchiefs, towels,

etc., taking care that the fundus of the uterus is below the plug.

A third method of temporarily checking bleeding consists in passing the fingers of one hand into the vagina, and placing them behind the cervix. The other hand is then placed on the fundus, and the whole uterus is firmly compressed between the two (*v.* Fig. 167).

Concealed hæmorrhage is detected by noticing the increase in size of the uterus, accompanied, if well marked, by the usual symptoms of hæmorrhage. In such cases, the uterus must be immediately emptied by expression, and, if this does not suffice, the treatment proper to external hæmorrhage is carried out.

SECONDARY POST PARTUM HÆMORRHAGE.

Secondary post partum hæmorrhage is the term applied to bleeding coming on more than six hours after delivery.

Ætiology.—This condition is due to separation of the thrombi in the uterine vessels, or to a congested condition of the endometrium. The former is caused by a sudden increase in the pressure in the vessels, or by sloughing of their walls. The latter is caused by a relaxed condition of the uterus due to the retention of pieces of placenta or membranes, by malposition of the uterus, or by fæcal accumulation. Chorion-epithelioma must also be remembered as a cause of very persistent secondary post partum hæmorrhage.

Treatment.—If the hæmorrhage is slight, free administration of ergot and expression of the clots may be sufficient. If these measures do not suffice, or if the hæmorrhage was severe from the first, a hot vaginal and

uterine douche must be given, and an attempt made to determine the cause of the bleeding. If a retro-deviation of the uterus is present, it must be corrected ; if a portion of placenta has been left behind, it must be removed by the fingers or a blunt flushing curette ; if a vessel is found spouting in the vaginal wall or cervix it must be tied. If the bleeding still continues, the uterus must be plugged with iodoform gauze.

Post-hæmorrhagic Collapse.—When a patient is attacked by any kind of hæmorrhage, there are two chief indications for treatment :—

- (1) The hæmorrhage must be checked.
- (2) The collapse which threatens to follow the hæmorrhage must be staved off.

We have described how hæmorrhage may be checked ; we shall now consider the treatment of the collapse. When a patient loses a large quantity of blood, death threatens. This occurs, not because there is an insufficient quantity of blood in the body, but because the blood-vessels have not had time to contract to suit their capacity to the diminished quantity of blood. Blood, consequently, does not return to the heart in sufficient amount ; the latter has not sufficient fluid to contract upon ; as a result, its contractions become more and more feeble, and an insufficiency of blood is sent to the brain. In consequence of this, feeble stimuli are transmitted to the heart, which fails still more, a vicious circle being thus established. Reasoning from this, we see that it is necessary to turn our treatment in three directions :—

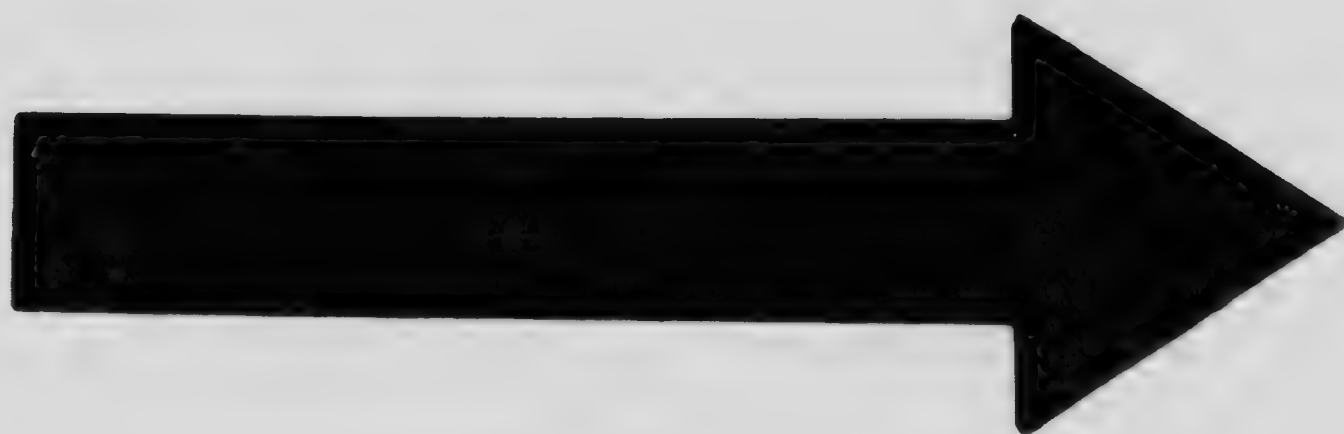
- (1) The heart must be stimulated.
- (2) The diminished quantity of blood must be limited, as far as possible, to the important organs of the body, *i. e.* the brain and the viscera.

(3) The amount of fluid in the blood-vessels must be increased.

We can stimulate the patient by giving alcohol by the mouth ; by the hypodermic injection of ether, strychnine, or brandy ; and by the use of hot fomentations over the heart. We can keep the blood in the important organs, first, by placing blocks beneath the foot of the bed, and thus making the patient's head the most dependent part of her body ; subsequently, by bandaging tightly the arms and legs, and thus preventing blood from being wasted in them. We can increase the quantity of fluid in the blood-vessels by giving plenty of fluid by the mouth ; by administering enemata of salt and water ; and by infusing saline solution directly into a vein, or into the connective tissues of the breast, axilla, or buttock.

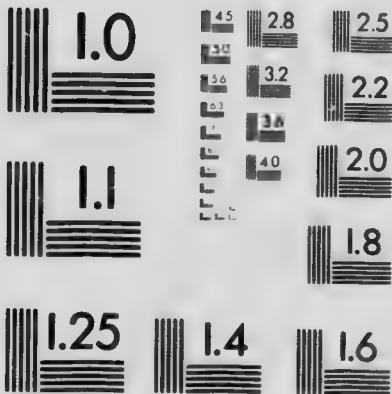
There are no special points in the above treatment which call for description, except the method of infusing saline solution. The apparatus required for injecting it directly into a vein consists of :—a small metal funnel which holds about three ounces (85 c.cs.) ; a rubber tube of about three feet (90 cm.) in length ; a small silver cannula ; a scalpel ; a dissecting forceps ; small needles ; needle-holder ; and fine silk or catgut. The solution used is made by adding a teaspoonful of salt to a pint of water (3·36 grms. to 568 c.cs.). If possible it must be sterilised by boiling, and must be used at a temperature of 100° F. (37·8° C.) If adrenalin, or any other reliable preparation containing suprarenal extract, is at hand, from three to four drachms of this (1 in 1000) should be added to the saline solution, as it promotes contraction of the arterioles, and so helps to raise the blood-pressure.

The operation itself is as follows :—Tie a bandage round the upper arm sufficiently tightly to compress the



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veins, but not the arteries. By this means the veins are made to stand out, and a suitable one can be selected. Expose the latter by means of an incision about an inch in length made over it, isolate a very small portion, and then slip two ligatures beneath it. The distal ligature is tied to prevent hæmorrhage, the vein is opened by a longitudinal incision sufficiently long to admit the cannula, and the cannula is introduced. Next tie with a single turn the proximal ligature, in such a manner that the vein is compressed

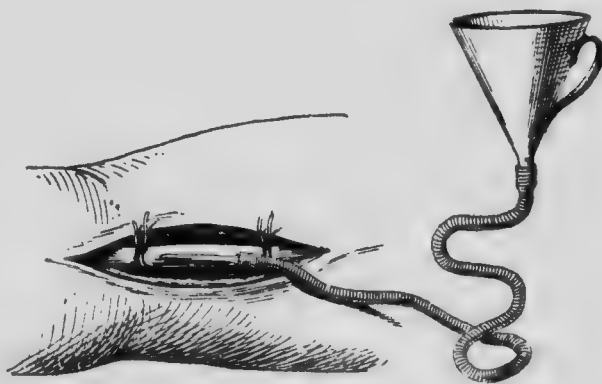


FIG. 168.—Apparatus, and method of inserting cannula, for intra-venous infusion of saline solution (diagrammatic).

against the cannula, in order to prevent the escape of the solution, and remove the bandage which was compressing the arm (*v.* Fig. 168). Before the cannula is introduced, the entire apparatus must be filled with saline solution, in order to prevent the possibility of the injection of air.

The fluid is now allowed to flow, an assistant taking care that the funnel is always filled with solution. As many as five, six, or even more pints may be injected in severe cases. By holding the funnel from ten to eighteen inches above the patient, the necessary pres-

sure is obtained. When sufficient fluid has been injected, as shown by an increase in the volume and strength of the pulse, the cannula is removed, the second ligature tied tightly, the vein cut across, and the skin wound stitched up with a continuous suture.

Infusion into the cellular tissue is often used as a substitute for intra-venous infusion, on account of the greater ease and rapidity with which it can be performed. The cellular tissue below the breast is well suited for the purpose, as it is easily reached, and has a considerable capacity. In hospitals, graduated bottles, suspended above the patient's bed, may be used to hold the saline solution. In private practice, a carefully sterilised jug and a syphon douche may be used. A head of about three to five feet (91·5–152·5 cms.) is required to make the fluid run. To perform the operation, a long and slender aspirating needle is fastened to the end of the douche tube; the breast, after careful cleansing, is lifted as far as possible off the chest wall; and the needle is passed deeply into the sub-mammary tissue, taking care to avoid the gland tissue. The fluid is then allowed to run. As soon as no more fluid will run, the needle is withdrawn, and a piece of strapping fastened over the opening to prevent any escape. Each breast will hold about a pint and a half or two pints (852–1136 c.cs.), and the time required to infuse that amount is from fifteen to twenty minutes. Both breasts can be infused simultaneously.

Continuous rectal injections of saline solution may also be given. The fluid should be introduced slowly at the rate of about a pint or a pint and a half in the hour, as otherwise it may act as an enema and be expelled. The injection may be continued for several hours if the fluid is retained. Adrenalin may be added in the proportion of three drachms to the pint of water.

Rectal injections of strong black coffee, to which half an ounce of whiskey or brandy have been added, may also be given.

A patient, who has had severe hæmorrhage, must not be considered to be out of all danger once she has rallied from the primary collapse. The resulting enfeeblement of the circulation carries with it many dangers. The most common of these are cardiac syncope, coming on as the result of some sudden exertion; pulmonary embolus, due to the detachment of a thrombus whose formation has been favoured by the weak action of the heart; crural phlegmasia, from a like cause; and an increased risk of septic infection, owing to the lowering of the natural resistance offered by the system to bacterial invasion.

We shall conclude this chapter with a well known remark :—"Your patient should not be allowed to die of post partum hæmorrhage."

CHAPTER XXVII.

GENITAL INJURIES.

Hæmatoma of the Vagina and Vulva—Inversion of the Uterus—Rupture of the Uterus—Laceration of the Cervix—Laceration of the Perinæum.

HÆMATOMA OF THE VAGINA OR VULVA.

HÆMATOMA of the vagina or vulva is the term applied to a collection of blood in the areolar tissues about the vagina or vulva (*v.* Fig. 169).

Frequency.—At the Rotunda Hospital, amongst 36,227 patients, the relative frequency of hæmatoma of the vagina or vulva was 1 in 2012·61, *i. e.* 0·05 per cent.

Ætiology.—As the head descends through the vagina, the return flow of blood through the veins is obstructed, and so the intra-venous pressure is increased. Rupture of a vein may then result. Venous rupture due to laceration of the submucous tissues of the vagina or vulva may also occur, as a result of undue stretching of the tissues by the presenting part of the fœtus.

Varicosities of the vulvar or vaginal veins do not appear to predispose to this condition.

Symptoms.—The condition begins with the formation of a small tumour, elastic to the touch and of a blue colour, which gradually increases in size. The vein may rupture before or after delivery, but usually the condition is not noticed until after delivery. The other

symptoms are pain and collapse, both being in proportion to the size of the tumour.

Terminations.—The case may terminate in four ways if the condition remains untreated:—



FIG. 169.—Hæmatoma of the left labium.

(1) The tumour may rupture and free external hæmorrhage result.

(2) The hæmorrhage may extend interstitially upwards towards the abdomen, or downwards towards the

perinæum, according as the ruptured vessel is above or below the deep perinæal fascia. The patient may thus bleed to death into her pelvic connective-tissue.

(3) The tumour if small may be absorbed aseptically.

(4) Suppuration or decomposition of the contents of the tumour may occur.

Treatment.—If the hæmatoma occurs before delivery, deliver at once. It will usually be possible to apply the forceps. If the tumour obstructs delivery owing to its size, it must be incised, its contents turned out, and the child delivered past it as rapidly as possible. If the tumour increases in size after delivery, and pressure fails to check the increase, or if it is of considerable size, it must also be opened, and its contents turned out. In any case in which incision is practised, the cavity should be douched out, and then plugged tightly with iodoform gauze. The plugging is changed every day until the cavity is obliterated. If the cavity is not very large, it may be possible to close it by means of deep sutures passed beneath it.

If the tumour is small, and is not increasing in size, it may be left to absorb. Suppuration should not occur; if it does occur, the abscess must be opened at once, and free drainage obtained.

Prognosis.—The prognosis depends upon the treatment adopted. The patient may die of hæmorrhage or of sepsis. Neither should occur if the case is correctly treated.

INVERSION OF THE UTERUS.

Acute inversion of the uterus is one of the rarest accidents met with in midwifery. The uterus becomes partly, or completely, turned inside out, so that the fundus appears through the cervix.

Ætiology.—Inversion is liable to occur in the case of

a large and lax, thin-walled uterus. It has been caused by:—

(1) Dragging on the placental site by means of the cord while the placenta is still adherent.

(2) Violent straining associated with sudden emptying of the uterus, *e. g.* precipitate labour, and severe straining and pressure in the removal of the after-birth (Winckel).

Symptoms.—The occurrence of inversion is usually followed immediately by the extreme collapse of the patient; more rarely the collapse does not come on for some hours. There may or may not be severe hæmorrhage.

Diagnosis.—If the hand is placed upon the abdominal wall, the absence of the fundus of the uterus from its usual position will be readily determined. If a careful examination is made, it may be possible to determine the existence of a cup-shaped depression corresponding more or less exactly to the former position of the upper part of the cervical canal. At the same time the vagina is found to be occupied by a globular tumour to which the placenta may or may not be attached. The diagnosis is then at once obvious. If the inversion is only partial, the non-inverted portion of the body of the uterus will be felt with a similar cup-shaped depression in its centre.

Treatment.—If the placenta is still adherent, it should be removed and the uterus immediately replaced. To do this, the uterus is grasped in the hand and pushed gently upwards, trying to return first the part which came down last. The uterus is then thoroughly douched with cyllin solution, and is plugged with iodoform gauze to promote contraction, and to prevent a possible return of the inversion.

RUPTURE OF THE UTERUS.

Rupture of the uterus may occur at any stage of labour. It is a rare accident, but is perhaps not quite so rare as is usually believed. Any portion of the uterus may rupture, but, with a very few exceptions, the rupture always begins in the thin lower uterine segment (*v.* page 122) (*v.* Figs. 170 and 171). Starting there, it may extend in any direction—upwards towards the fundus, downwards towards the vagina, or circularly round the uterus. In the last case, the entire lower uterine segment may be torn off. A distinct variety of rupture, *viz.* rupture by attrition—or rubbing through—of a portion of the uterine wall, is sometimes met with. This particularly happens in cases of flattened pelvis, where the uterus may become caught between the descending head and the promontory of the sacrum. In these cases a circular hole may be rubbed through the wall of the uterus; or, more commonly, perhaps, the vitality of the compressed portion may be so destroyed that it sloughs away after delivery. There are two degrees of rupture:—

- (1) *Complete*, when the laceration extends through the uterine wall and the investing peritoneum.
- (2) *Incomplete*, when the peritoneum is intact, and there is no communication between the uterus and the peritoneal cavity.

Ætiology.—The chief causes of ruptured uterus are:—

- (1) Obstructed delivery from any cause, as,—contracted pelvis, cross-birth, hydrocephalic head, tumours blocking the pelvis, etc.
 - (2) Fatty degeneration of the uterus.
 - (3) A weak cicatrix resulting from a former Cæsarean section.
- (1) In obstructed delivery, rupture always begins in

the lower uterine segment, because, as a result of the retraction of the muscle - fibres, the fundus becomes thicker and its cavity smaller, while the lower uterine



FIG. 170.—Thinning of lower uterine segment in a case of obstructed labour.

segment becomes progressively thinner and weaker in consequence of its overdistension by the crowding of the foetus into it (v. page 122).

(2) In fatty degeneration, rupture may occur in any

part of the uterus. It may occur at the beginning of labour, and it cannot be foreseen.

(3) The cicatrix of a former Cæsarean section may rupture during a subsequent labour, if it has not united firmly.



FIG. 171.—Rupture of the thinned lower uterine segment.

Symptoms.—It is best to consider the symptoms of rupture of the uterus under three heads, viz.:—

- (A) Threatened rupture.
- (B) Sudden rupture.
- (C) Gradual rupture.

(A) **Threatened Rupture.**—The symptoms of threatened rupture of the uterus are:—a rising temperature—above 101° F. (38.3° C.); an increasing pulse-rate—more than 110 per minute; continuous or tonic uterine contractions; the retraction ring felt more than one and

a half inches (4 cms.) above the symphysis; ballooning of the vault of the vagina; standing out and tenseness of one or both round ligaments.

(B) **Sudden Rupture.**—The symptoms of sudden rupture are:—a sensation as if something had burst internally; cessation of labour pains; recession of the presenting part, unless it is already fixed; collapse, rapid pulse, falling temperature, all in proportion to the amount of hæmorrhage that is occurring; and intense pain over the abdomen. These are the classical symptoms, but any or all of them may be absent.

(C) **Gradual Rupture.**—This is the manner in which rupture most frequently occurs, and its symptoms are ill defined. Nothing abnormal may be noticed until the time comes to remove the placenta, when, upon introducing the hand into the uterus, the rent is discovered. If there is hæmorrhage, there will, of course, be the symptoms of collapse. If rupture is so extensive that the child escapes into the abdomen, the empty uterus may be felt by abdominal palpation lying tightly contracted at the pelvic brim, and the foetal parts will be felt with unusual distinctness.

Treatment.—The treatment is prophylactic or curative, as the case may require.

Prophylactic Treatment.—The prophylactic treatment consists in correcting malpresentations of the child or obliquity of the uterus, and in immediate delivery if the indications of threatened rupture appear. If the anterior lip descends in front of the head, and becomes caught between the latter and the symphysis, it must be pushed above the convexity of the head, and kept there during a pain. It will then remain up of itself.

Curative Treatment.—The curative treatment depends entirely upon the condition of affairs present. If

the child is undelivered when the rupture is diagnosed, it must be delivered at once. If it is in the uterus, perforate the head and extract it; if it has escaped into the abdomen, cœliotomy is necessary. If there is much hæmorrhage from the laceration, the uterus must be removed. If the child is already delivered before the rent is noticed, the treatment to be adopted depends upon the amount of hæmorrhage. Remove the placenta, and, if there is no hæmorrhage to signify, pass a strip of gauze through the rent, so as to allow drainage. No further treatment is necessary. The gauze should be removed in twenty-four hours. If there is much hæmorrhage, abdominal cœliotomy followed by the removal of the uterus is indicated. The most suitable form of hysterectomy in these cases is supra-vaginal amputation of the uterus by Kelly's method, but sometimes complete hysterectomy may be preferred.

Dangers.—The dangers of rupture of the uterus are :—

- (1) Hæmorrhage.
- (2) Sepsis.

If the former occurs, it must be treated as described. The latter will not occur in a healthy patient, if all due aseptic precautions have been taken.

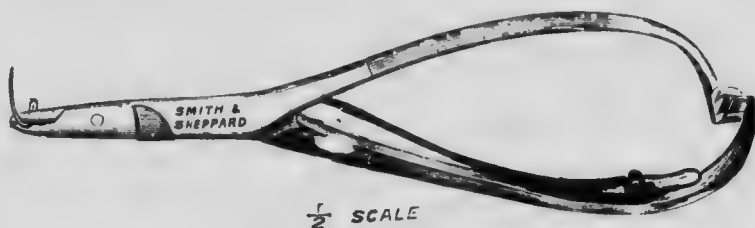
LACERATION OF THE CERVIX.

Lacerations of the cervix are seldom recognised unless they cause hæmorrhage. Their treatment in that case is described under the head of post partum hæmorrhage (*v.* page 435).

LACERATION OF THE PERINÆUM.

This is one of the commonest accidents of midwifery. It occurs far more frequently than is supposed; as,

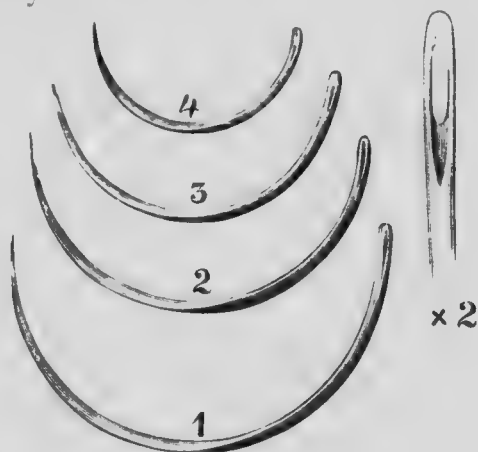
unless it is looked for with care, it may not be noticed.
There are two degrees of laceration of the perinæum:—



$\frac{1}{2}$ SCALE

FIG. 172.—Doyen's needle-holder.

- (1) *Complete*, where the laceration extends right through the perinæal body into the rectum.
- (2) *Incomplete*, where the laceration involves the perinæal body alone.



Same Size

FIG. 173. Whole-curve needles; large, medium, and small.

Lacerations of the perinæum must be sutured immediately after they occur, for two important reasons:—

- (1) To prevent the formation of a puerperal ulcer (v. page 465).
- (2) To prevent subsequent prolapse of the uterus.

A deep laceration of the perinæum almost always involves the levator ani muscle, and, if this remains ununited, the anterior vaginal wall has lost its support, and the integrity of the floor of the pelvis is destroyed.

Instruments.—The following instruments are required:



FIG. 174.—Incomplete laceration of the perinæum, with continuous sutures in the vaginal tear, and interrupted sutures in the skin tear and the muscles.

—Needle-holder (*v.* Fig. 172); silk-worm gut or catgut sutures; large and medium-sized whole-curve needles (*v.* Fig. 173); and a pair of scissors.

Operation.—When suturing a perinæal laceration the patient must be placed in the cross-bed position, as

it is impossible to suture lacerations of the vaginal wall satisfactorily while she lies on her side. The operation for a complete laceration is as follows:—The first step consists in turning the complete lacera-



FIG. 175.—Incomplete laceration of the perinæum, showing the sutures tied.

tion into an incomplete laceration, by suturing the rent in the anterior rectal wall. This may be done, if the rent is small—up to half an inch in depth—by means of a purse-string suture which runs round the laceration. If the tear in the rectal wall is large, it is better to suture it from above downwards with a continuous

catgut suture (*v.* Fig. 176). This suture takes up the rectal wall, with the exception of the mucous membrane, at each side, and so brings together the torn edges of the rectum. The ends of the torn sphincter and levator ani muscles are then picked up in turn and brought together by interrupted sutures of catgut. Next



FIG. 176.—Complete laceration of perinæum with continuous catgut sutures in rectal and vaginal tear. (Modified from 'The Norris Text-book of Obstetrics.')

the edges of the torn vaginal mucous membrane are brought together by a continuous suture, also of catgut, from above downwards. Finally, the torn edges of perinæal skin are brought together by sutures, passed from the external aspect of the perinæum. They are entered at the side of the laceration, passed through the levator ani muscles between the buried sutures, almost to the bottom of the tear, and brought out at the corresponding

point upon the other side. They must be tied from behind forwards, and is comparably the best material to use is silkworm gut, as it does not absorb discharge.

If the laceration involves the perinæal body only, and does not extend far up the vaginal mucous membrane, interrupted perinæal sutures will be sufficient; but, if the laceration extends for any considerable distance up



FIG. 177.—Complete laceration of perinæum turned into an incomplete laceration by suturing rectal tear. Continuous suture in vaginal wall, and perinæal sutures in position. (Modified from 'The Norris Text-book of Obstetrics.')

the posterior vaginal wall, the edges of the latter must be stitched separately with a continuous catgut suture, the stitches being passed from the vagina (*v.* Fig. 174). If the torn edges of the levator ani muscle are exposed, they should be brought together by buried catgut sutures before passing the perinæal sutures.

After-treatment.—The wound must be kept as dry as possible during the puerperium. It should be washed

regularly night and morning, dusted with boracic powder, and covered with a sterilised dressing. It should also be bathed and powdered after the patient passes water. In the case of a complete laceration, the bowels may be kept confined until the fourth or fifth day, and then it is well to give an olive oil enema, as well as a purgative, in order to ensure that the fæces are soft. In all cases the stitches should be removed on the eighth day, unless they are catgut, which is absorbed.

CHAPTER XXVIII.

SAPRÆMIA AND SEPTIC INFECTION.

Varieties—Sapræmic Infection: *Ætiology*, *Symptoms*, *Prognosis*, *Treatment*—Septic Infection: *Ætiology*, *Consequences*—Local Septic Infection: *Symptoms*, *Treatment*—General Septic Infection: Varieties—Lymphatic Sepsis: *Symptoms*, *Prognosis*, *Treatment*, *Antistreptococcic Serum*—Pyæmia: *Ætiology*, *Symptoms*, *Prognosis*, *Treatment*.

INVASION of the genital tract by pathogenic bacteria manifests itself, during pregnancy or the puerperium, in two distinct forms :—

- I. Sapræmia.
- II. Septic infection.

I. SAPRÆMIA.

Sapræmia is the condition of intoxication resulting from the absorption of the poisons produced by putrefactive decomposition. If air gains admission into the vagina or uterus during or subsequent to the third stage of labour, saprophytic organisms may be carried in along with it. They lodge in any dead matter, as blood-clots or portions of placenta, and there generate poisons. In some cases these are expelled as fast as they form, and give rise to few symptoms; but, in other cases, where there is an obstruction to their escape, they are absorbed by the patient, and *sapræmia*,

or sapræmic intoxication, results. If the decomposing matter is allowed to remain in the uterus, the endometrium is attacked and a putrid endometritis results.

Ætiology.—Sapræmic infection is the result of the association of two factors, first the entrance of saprophytic organisms, and secondly the presence of dead or necrosing matter in the genital tract, on which these organisms can live. Saprophytic organisms are probably carried into the genital tract in the air, and anything that facilitates the entrance of air directly increases the number of organisms that gain admission. As definite causes of air entrance may be mentioned the introduction of the hand or of instruments after delivery, and the lateral position of the patient during the third stage. Saprophytic organisms may also gain admission by the direct upward extension of an external decomposition. Improper management of the third stage of labour, *i. e.* premature expulsion of the placenta and consequent retention of fragments, is the common cause of the presence of dead matter in the uterus. Prolonged labour by causing crushing and necrosis of the soft parts, insufficient contraction by allowing the uterus to fill with clots subsequent to the expulsion of the placenta, and the retention of the lochia in the uterus and vagina, are also well recognised causes.

Symptoms.—The symptoms of sapræmic infection are of two kinds :—constitutional and local. The constitutional symptoms are the result of the absorption of poisons, the product of the decomposition ; while the local symptoms are due to the presence of decomposing matter in the genital tract, and to the effect of this decomposition on the surrounding tissues. The constitutional symptoms set in from the third to the fifth day after the birth of the child, and usually begin gradually. The temperature rises to 101° or 102° F. (38.3° – 38.8° C.),

and the pulse becomes proportionately rapid. If the case is treated, these symptoms disappear; otherwise the temperature rises higher on the following night, and the patient may have a slight rigor. If the case is still untreated, the symptoms become very much more marked, the patient may feel very ill, indeed, and, in exceptional cases, may die as a result of what is practically ptomaine poisoning. More usually, however, the local symptoms are more marked than the constitutional symptoms. The first local symptom to appear is a foetid condition of the lochia, which change from the normal sero-sanguineous discharge to an offensive fluid that is abundant, and sometimes frothy owing to the presence of gas-producing bacteria. The stain, which such lochia leave upon the sheet or diaper, also is changed. Healthy lochia cause a stain resembling that left by a drop of blood. It is deep red in the centre, and gradually fades into a serous margin. Putrid lochia on the other hand cause a stain, with a hard, well marked edge, the colour fading slightly towards the centre.

If the intra-uterine decomposition continues, the uterine wall is in turn invaded by the putrefactive organisms. It is possible that bacteria, which at the onset were saprophytic, and so were only able to live upon dead matter, can, under suitable conditions, produce an advancing necrosis of living tissue. These suitable conditions occur in the case of a neglected sapræmia. Consequently, the bacteria may now attack the uterus itself and cause a putrid endometritis. The chief symptom of this condition is a very foul-smelling and profuse discharge coming from a subinvolted uterus.

In such cases the uterine wall is covered by a thick layer of necrotic material, which contains swarms of

the invading bacteria. Under this layer lies a thick zone of small-celled infiltration, and below this again lies unaffected uterine muscle. The bacteria are almost entirely limited to the superficial necrotic layer, and, in this respect, as will be presently seen, the condition contrasts markedly with septic endometritis (*v.* page 473). The subsequent course of cases of pure saprophytic infection does not appear to have been clearly determined. Doubtless, in the majority of cases, the superficial necrotic layer is gradually detached and expelled in the lochia, and recovery results. In other cases, the patient may die of ptomaine poisoning, and, in still other cases, pyogenic organisms may effect an entrance and a mixed infection result. In such cases the subsequent history of the case is that of septic endometritis. It is most improbable that a pure saprophytic infection ever extends beyond the uterus and gives rise to parametritis, tubal infection, or peritonitis. It may do so, but it is more probable that in those cases in which it appears to have done so, the infection was in reality a "mixed" septic and saprophytic infection. A pure saprophytic infection is a comparatively rare occurrence as the saprophytes are quickly reinforced by pyogenic organisms.

A frequent concomitant of sapræmic infection of the genital tract is the condition known as *puerperal ulcer*. This is an ulcer of varying size, with a grey sloughing base and an inflamed margin. It forms on lacerations of the genital tract, and causes a profuse foul discharge, accompanied by a rise of temperature and other slight constitutional disturbances. Sometimes it is found as the sole consequence of sapræmic infection, the uterine cavity having escaped.

Prognosis.—If sapræmia is treated in time, the patient almost always recovers. If the condition is untreated,

she may die from ptomaine poisoning, or, in the case of a "mixed" infection, from general sepsis. If extension of the infection to the tubes takes place, she may die of septic peritonitis; and, even in the most favourable cases, she will be an invalid for a long time, and perhaps for life.

Treatment.—The prophylactic treatment of sapræmia consists in the proper management of the third stage of labour, and in the maintenance of vaginal asepsis during the puerperium. If sapræmia occurs, it must be treated at once. When the symptoms first appear, make the patient sit up as much as possible. If this is considered unwise, raise the head of the bed, and so favour free drainage from the vagina. With the same object, administer a purgative, which, by causing bearing-down efforts, assists in emptying the vagina. If, in spite of this treatment, the temperature still keeps high, a copious douche of hot cyllin or lysol solution (1 in 320) must be given. If the decomposition is limited to the vagina the douche may be similarly limited, but if, as is usually the case, there is reason to think that the uterus also is affected, vaginal and uterine douches should be given. The vaginal douche may be given with a glass nozzle, but for the uterine douche a large-sized Bozemann's catheter should be used in order to permit of free return of the fluid. In the great majority of cases the temperature will now fall. If it still remains high, the uterus must be douched twice daily.

There are two other germicides from which we should be disposed to expect good results, namely formalin and peroxide of hydrogen. Formalin may be used at a strength of from ten to fifty per cent., and should be injected directly into the uterine cavity, to prevent it from coming into contact with lacerations of the vagina

or cervix, and then should be washed away as soon as it has acted for the required time. If it is used at a strength of fifty per cent. it should not be allowed to act for more than thirty seconds, but, if used weaker, it may act for a proportionately longer time. If it causes pain it must be washed away immediately, and so, when it is about to be injected, the operator must have a douche and Bozemann's catheter ready for immediate use. Peroxide of hydrogen may be used at a strength of from thirty to fifty per cent., and may be added to the douche, or directly injected into the uterus. On meeting with the decomposing lochia, oxygen is set free and effervescence occurs. The peroxide should be slowly injected until effervescence ceases.

If the discharge remains foul in spite of two or three intra-uterine douches, the uterus should be carefully explored with a blunt Rheinstädter's douche curette or with the finger, in order to find and remove any portion of placenta or of membrane which has been left behind. If a curette is used, it is passed gently up to the fundus, and then brought down again very gently, with its edge just in contact with the uterine wall. It is then passed up again, and again withdrawn, and so on until the entire inner surface of the uterus has been covered. The object of this is not to curette away the lining of the uterus so much as to note the presence of, and to remove, any projecting pieces of placenta or decidual *débris*. An actual curetting is very seldom indicated, as there is a danger of breaking through the leucocytic wall and of causing a dissemination of the infection. Even when one decides to curette, the procedure must be done with a very light hand. If the curette is pressed forcibly against the uterine wall, it is quite possible to bring away portions of the softened uterine wall, a procedure which is most inadvisable, both

because it removes tissue which ought not to be removed, and because it opens up fresh paths by which a mixed infection can travel beyond the uterus.

When a foetid discharge persists in spite of douching or when the uterine cavity is large and lochia are retained in it, we prefer the use of a tight plug of iodoform gauze to the curette. The plug may be inserted after douching and removed the following day a fresh plug being then inserted if necessary. This method of treatment should be followed until decomposition has ceased. The treatment of cases in which the infection extends beyond the uterus, and in which we are in all probability dealing with a mixed infection, will be discussed later (v. page 474). Unless we are obviously dealing with a sapræmic infection, fluid should always be removed from the uterine cavity, as will be described (v. page 475), and subjected to a bacteriological examination.

If a puerperal ulcer forms, and there is no reason to suspect infection of the uterine cavity, the treatment is at first purely local, and consists in the careful washing away of all discharge and in the application of iodoform powder to the ulcer. Vaginal douching is contra-indicated, unless the vagina or uterus is also infected, lest the putrid discharge should be carried up into the uterus. Instead, it is better to raise the head of the bed or to let the patient sit up, and so favour free drainage. If the ulcer is situated in the vagina, the latter may be plugged twice daily with iodoform gauze. If it becomes necessary to douche, a very low pressure of water should be used.

In all cases the patient must get plenty of nutritious and digestible food. The free use of ergot is also advisable, as, by promoting contraction of the uterus, it assists in expelling clots and lochia, and at the same

time hinders absorption. One or two drachms of the liquid extract may be given night and morning. We have latterly given up the use of alcohol in these cases.

II. SEPTIC INFECTION.

Puerperal septic infection is the result of the invasion of the genital tract by pyogenic organisms. It is one of the most serious diseases to which pregnant women are liable. In the past it was the cause of the high rate of mortality which prevailed in lying-in institutions, and though at the present time the practice of asepsis and the use of antiseptics have banished it, to a very great extent, from properly managed hospitals, still in private practice it is a great deal too common. As will be seen, it may assume various forms, but in all cases it begins as a local infection, the direct result of the introduction of pyogenic bacteria to the genital tract.

Ætiology.—Septic infection in childbirth, or "puerperal fever," as it was formerly termed, was, for many years, regarded as a specific disease peculiar to lying-in women, and was attributed to many and various causes, which were as a rule characterised by their indefinite nature. One of the earliest notions attributed it to the retention of lochia, and this theory held the field for many centuries. In more recent times, other notions were held regarding its ætiology, and it was variously attributed to "the metastasis of milk to the womb," to climatic and atmospheric influences, to the influences of locality, to emotional causes, and to the "act of God."

Semmelweis was among the first to draw attention to its true nature, and the principles which he laid down on clinical grounds have been subsequently confirmed and

placed on a sure basis by the scientific work of Lister and Pasteur. It is now definitely established and universally accepted that the "puerperal fever" of former days is due to an infection of the genital tract by septic organisms, and that it is identical in every particular with the septic infection of wounds.

The following bacteria, as far as we know at present, are the principal causes of septic infection during parturition:—*Streptococcus pyogenes*, *Staphylococcus aureus*, *Gonococcus*, *Bacillus coli communis*. The first two are considerably the most common, and one or both of them are present in almost every case of septic infection. Other organisms than those mentioned have occasionally been found.

We have already referred to the usual manner in which these organisms obtain access to the genital canal (v. page 3), namely, on the hands or instruments of the obstetrician or midwife. A few rarer modes in which infection can be introduced must now be mentioned. In local septic conditions of the vulva or vagina, bacteria may reach the uterine cavity by direct extension, or may be carried up on the fingers or in douches. The patient may herself introduce bacteria by passing her fingers into the vagina. Coitus during the last few days of pregnancy, or shortly after delivery, may be responsible, and in such cases the infection is not infrequently gonorrhoeal.

Consequences of Infection.—In all cases, the infection is at first a local one, and begins either in the vagina or in the uterus. Its subsequent course depends upon the nature and the virulence of the infecting bacteria, and the powers of resistance of the patient. If the virulence of the bacteria is of low degree, the infection is at first limited to whatever part of the genital canal was inoculated, or extension may take

place locally—to the tubes, the pelvic cellular tissue, and the pelvic peritoneum, and in the case of a more virulent infection, to the general peritoneal cavity. In some cases the local infection remains the serious and prominent feature of the case, and according to its extent and severity the patient may gradually recover or may die; but, in other cases, the local trouble is only the starting point from which bacteria may subsequently extend into the circulation of the patient, and give rise to a general infection. If, on the other hand, the virulence of the infecting bacteria is very great, the local effect of the infection may be so slight as to escape notice, and the bacteria may pass almost directly into the circulation of the patient and give rise to a general infection.

Accordingly, we see that septic infection occurs in two different forms. These are:—

(A) As a local infection, in which the symptoms of the patient are due to the local infection of one or more of the pelvic structures, or of the general peritoneal cavity.

(B) As a general infection, in which the symptoms of the patient are due to the entrance of bacteria into the general circulation.

It must be remembered that these two classes often merge into each other.

LOCAL SEPTIC INFECTION.

Local septic infection of the genital tract is the most common form in which puerperal septic infection manifests itself. Pyogenic organisms are carried into the uterus and lodge in the placental site or in some laceration which has occurred in the cervix or vagina. From

here they may extend to the surrounding structures or to the general peritoneal cavity.

When the placental site is infected, the remainder of the uterine cavity is usually rapidly involved, and a septic endometritis results. When a laceration of the cervix or vagina is alone attacked, a septic form of puerperal ulcer results, or, more rarely, a general septic vaginitis.

The condition of the uterine wall in septic endometritis differs markedly from its condition in putrid endometritis (*v.* page 464). The necrotic layer, with which the inside of the uterus is covered, is thinner than that found in association with sapræmic infection. The zone of small-celled infiltration is very thin, and is sometimes almost absent, while the infecting bacteria, which in putrid endometritis are altogether superficial to this zone, in septic endometritis are found both in the zone itself, beneath it amongst the uterine muscle, and in some cases even in the peritoneal coat. The more acute and virulent the infection, the less marked are the uterine changes until, in a virulent streptococcic infection, no change is noted in the uterine wall, although it is invaded in all directions by the infecting organism.

If the infection remains limited to the uterus or the vagina, the acute inflammation gradually passes into a chronic one, which may persist for a long time. On the other hand, the infection may pass beyond the uterus, either by travelling directly through the uterine wall to the parametrium or the peritoneum, or through the tubes to the peritoneal cavity. If the parametrium is infected, a cellulitis results, which may extend right round the uterus or may be limited to one or other side. In such cases a serous exudate is poured out into the parametric tissues, and this can be felt as a hard mass

in which the uterus is apparently embedded. In some cases, the infection is gradually overcome and the exudate is absorbed, but, in other cases, an abscess forms, which may burst into any of the neighbouring viscera, into the peritoneal cavity, into the vagina, or externally.

If the tubes are infected a septic salpingitis results, and in many cases the infection extends onwards into the peritoneal cavity. Here, as a rule, an adhesive peritonitis glues the pelvic peritoneum together, and prevents the extension of infection beyond the pelvic cavity. This is the commonest termination of such cases, and is the cause of subsequent adherent retro-deviations, fixed ovaries, and pyosalpinx. If, however, the virulence of the infecting organism is considerable, extension may occur before adhesions have time to form, and a general septic peritonitis results.

Another and a most serious consequence, which may follow septic endometritis, is the formation of septic thrombi in the uterine sinuses. If this occurs the thrombus may break down, and the particles be set free in the blood-stream and carried to other parts of the body, or the thrombosis may extend outwards into the uterine or ovarian veins, and thence into the internal iliac veins or even into the inferior vena cava. In such cases a general pyæmic infection will result.

Symptoms.—The symptoms of a septic endometritis are both local and general. The local symptoms are like those of putrid endometritis, and are in inverse proportion to the virulence of the infecting organism. If the virulence is very great, the local symptoms are slight. If, on the other hand, the virulence is less, the local symptoms are well marked in correspondence with the changes which have occurred in the uterus. The lochia are altered from a sero-sanguineous or serous

fluid to one consisting partly of blood and partly of pus. The quantity is not increased unless there is an accompanying sapræmic infection, in which case the lochia are fœtid, and contain shreds of necrotic mucous membrane, and endometrium. Involution of the uterus ceases, and the organ is large, soft, and sometimes extremely tender. If the vagina is also infected, its mucous membrane and also the vulva are swollen and inflamed. The constitutional symptoms are in direct proportion to the virulence of the infecting organism, and consist in an elevation of the temperature to 104° F. (40° C.), or even higher, a proportionate increase in the pulse rate, general malaise, and the occurrence of one or more rigors.

The extension of the infection beyond the uterus into the tubes, the parametrium, or the general peritoneal cavity is shown by the occurrence of intense pain over the lower part of the abdomen, and by a further rise in the temperature and pulse-rate. The severity of the pain is proportionate to the formation of adhesions, and in those cases in which a general infection of the peritoneal cavity occurs, pain may be almost or entirely absent. Its occurrence, therefore, is a favourable sign, as showing the limitation of the infection. The occurrence of rigors usually points to the presence of thrombosis either in the uterine sinuses or the pelvic veins, and to the passage of infected emboli from these thrombi into the general circulation. The presence of inflammatory exudates, or of collections of pus in the tubes or pelvic cavity, can be determined by bimanual examination, and by palpation of the lower part of the abdomen, and the presence of pelvic thrombosis can also be similarly detected in favourable cases.

The bacteriological examination of these cases is essential wherever possible, with a view both to their

prognosis and to their treatment. This examination is carried out on portions of the discharge removed at the first or second examination. It is essential to obtain the uterine discharge without external contamination, as, if fluid from the vagina is allowed to mix with it, the results will be altogether misleading. A good method of obtaining it is as follows:—After disinfection of the vulva, the cervix is caught with a bullet-forceps and drawn down, and a posterior speculum is introduced. The vaginal mucous membrane is then carefully wiped with swabs of sterilised gauze or cotton-wool to remove discharge, and the external os and cervical canal are successively wiped with fresh swabs. A thin glass tube about three-sixteenths of an inch in diameter and about nine inches long, and bent to a slight curve, is then taken, and pushed gently through the cervical canal and up to the fundus of the uterus. Gentle scraping with the end of the tube in the uterus detaches small flakes from the uterine wall, and these are sucked up into the tube along with the lochia by means of suction applied by a small glass syringe to the other end of the tube. The tube is then withdrawn, and sealed at each end.

Having obtained the necessary material, a portion of it is examined at once under the microscope as a cover-glass preparation, whilst suitable culture media are inoculated with other portions. The growth obtained in these serves, in association with the preliminary examination, to identify the infecting bacterium, and further is available for the manufacture of an auto-genous vaccine if required.

Treatment.—The treatment of septic endometritis is very similar to that of putrid endometritis, except that, if we know the case to be one of pure pyogenic infection, curetting is even more definitely contra-indicated,

as the consequence of opening channels through which the infection can extend beyond the uterus is more serious. When it is thought that there may be placental remains in the uterus the best course is to explore the cavity with the finger. If fragments are found they may be removed with the blunt curette and by douching and iodoform gauze packing. Formalin may also be injected into the uterus, as has been described (*v.* page 466). If, however, the inside of the uterus is apparently unaffected there is nothing to be gained by further local treatment, and one is more inclined to rely on vaccines and suitable constitutional treatment, as will be described later (*v.* page 478). In all cases it is well to administer ergot freely to promote uterine contraction. In septic conditions of the vagina, the canal should be plugged with iodoform gauze twice a day, and any ulcers dusted over with iodoform powder.

If the infection extends beyond the uterus, pain must be relieved by hot stupes and by hypodermic injections of morphia. The patient should be freely purged, and her strength well maintained with fluid nourishment. Vaccines made from the invading organism should also be given. Hot vaginal douches may be given frequently to relieve pain. If an abscess forms, it must be opened at once, and in such a manner as to avoid infection of the peritoneal cavity. If a general septic peritonitis occurs, the only treatment which offers any prospect of saving the life of the patient is abdominal coeliotomy and the flushing out of the peritoneal cavity with normal saline solution, followed by drainage, if possible both through the vagina and through the abdominal wall. The treatment of pelvic thrombosis will be discussed later.

GENERAL SEPTIC INFECTION.

General septic infection is the result of the invasion of the circulatory system by pyogenic bacteria, which gain entrance through the lymph stream or through the veins, and tend to cause the death of the patient either by the toxins which they generate, or by setting up inflammatory processes in vital organs. It may be divided, according to the path by which the bacteria reach the system, into:—

- (a) Septicæmia or lymphatic sepsis.
- (b) Pyæmia or venous sepsis.

LYMPHATIC SEPSIS.

Septicæmia or lymphatic sepsis is the term applied to the condition that results from the entrance of pyogenic bacteria by way of the lymphatics into the circulation of the patient. It is the most fatal disease to which puerperal women are liable, and is due to the inoculation of some part of the genital tract with a virulent form of *Streptococcus pyogenes*. According to the degree of virulence, the streptococci may pass directly into the lymph channels without giving rise to any local changes, or a local change, such as septic endometritis, may first occur, and then extension into the lymph channels follow.

Symptoms.—The symptoms appear from twenty-four to fifty hours after inoculation. They are usually ushered in by a severe rigor, during which the temperature rises to 104° or 106° F. (40°–41° C.). The pulse is exceedingly frequent, and is even out of proportion to the temperature. The rigor may or may not recur; the patient is at first bathed in a profuse sweat, but

later all sweating may cease, to come on again just before death. The secretions peculiar to the puerperium, *i.e.* the lochia and milk, cease completely, or fail to become established. The patient looks extremely ill, and is sleepless. Her face is pinched, and has a sub-icteric tinge; the angles of the mouth and nose are drawn down, and the eyes appear sunken into the head. A very common symptom is extreme depression. In some of the worst cases, however, the patient may say that she feels extremely well, and may even wish to be allowed up (*v.* page 258). This condition is known as *euphoria*, and is due to the fact that the higher centres are dulled by the poison which is circulating in the system. It is a sign of the worst possible import. A frequent concomitant of the general infection of the patient is a diffuse septic peritonitis. The duration of the disease is at the most a week, often only a couple of days. The temperature rises during the entire time and may reach 106° or 107° F. (41° – 41.6° C.). Towards the last the heart fails rapidly.

Prognosis.—A short time ago the prognosis was absolutely bad, but it has been somewhat improved by the introduction of vaccine treatment.

Treatment.—When the symptoms appear, the vagina and uterus should be douched, on the chance that the attack may be due to a local infection, and material should be obtained from the uterus for a bacteriological examination. If, however, the symptoms do not improve rapidly, it is useless to continue the douches. In such cases we rely most on suitable vaccines, either alone or in combination with sera. The method of administering them, which has been adopted in the Rotunda Hospital, is as follows:—In the great majority of cases bacteriological examination of the fluid removed from an infected uterus, shows the infecting organism to be either

Streptococcus pyogenes or *Staphylococcus aureus*, though occasionally one of the other organisms already mentioned may be found (v. page 470). As soon as the diagnosis is made, one should administer a stock vaccine of the organism found, obtained from a reliable maker of such vaccines. In streptococcal infections a suitable initial dose is 5,000,000 cocci, in staphylococcal infections 25,000,000. These inoculations are repeated every second day, until recovery results. If the doses given appear to produce some, but an insufficient, reaction, they may be doubled or increased still further. In streptococcal infection the effect of the vaccine may be increased by the simultaneous use of anti-streptococcic serum.

It not infrequently happens that the administration of a stock vaccine produces insufficient results. It is then necessary to employ an autogenous vaccine, *i. e.* one made from the organism separated from the patient herself. It is therefore wise in every case to try to obtain a pure culture from the uterine lochia, from which a vaccine can be made when necessary.

Vaccines are given by hypodermic or intra-muscular injection. The back or the fore or upper arm may be chosen, and strict aseptic precautions must be observed.

The use of alcohol in septic infection has been abandoned, except in small quantities when a cardiac stimulant is required. Strychnine may also be given, either hypodermically or by the mouth, with a similar object.

Extreme elevation of temperature must be treated by sponging with cold or iced water. Chemical antipyretics are, as a rule, useless. Good results have been obtained by the subcutaneous injection of normal saline solution. From one to three pints may be injected at the time, and the injection repeated at intervals of twelve hours (v. page 445).

Other remedial measures that have been recommended are unguentum Credé and a substance known as nuclein. Unguentum Credé, as its name implies was introduced by Credé, and contains fifteen per cent. of a silver salt called collargol. Cases, in which apparent benefit has followed its use, have been recorded, and, as it is a simply adopted remedy, it may be tried without prejudicing the effect of other treatment. From fifteen to forty-five grains should be rubbed once or twice daily into the skin on the inner aspect of the thigh, the duration of the inunction being from fifteen to twenty minutes. The site of inunction should be then covered with rubber tissue. Another method of introducing the silver into the system consists in the injection of soluble collargol, dissolved in distilled water, under the skin, or into a vein. A half or a one per cent. solution is used, and, as a rule, from two and a half to five drachms of the former, or from a drachm and a quarter to two drachms and a half of the latter are injected.

Nuclein is a substance obtained from yeast, and is said to cause an artificial leucocytosis, and thus to increase the natural resistance to bacterial invasion. It can be given hypodermically or by the mouth. In the former case, the initial dose is ten minims twice a day, and this amount is increased by five minims daily. In the latter case, from half a drachm to a drachm is given twice daily. Like antistreptococcic serum, nuclein sometimes causes severe pains in the bones especially in the tibia, but these, as a rule, disappear within a week.

Personally, we have no experience of these remedies, as we consider that vaccine treatment gives better results.

PYÆMIA OR VENOUS SEPSIS.

Pyæmia or venous sepsis is due to the infection of the patient through the veins with pyogenic bacteria. The infecting bacteria, in most cases, are the same as those that cause acute sepsis, *viz.* *Staphylococcus aureus* and *Streptococcus pyogenes*. In most cases a septic endometritis first occurs and the bacteria are lodged in clots in the uterine sinuses. Inflammation and clotting may extend to the uterine or ovarian veins and thence to the internal iliac veins or the inferior vena cava. Thence, as the clots break down, the bacteria are carried in emboli to distant organs and tissues.

Symptoms.—The onset of pyæmic symptoms does not, as a rule, take place until the tenth day after delivery. The patient may have had an apparently normal puerperium up to that date, or she may have suffered from sapræmic infection of the uterus. The onset is marked by the occurrence of a severe rigor, followed by a rapid elevation of the temperature to 104° F. or 106° F. (40°–41° C.). The pulse rate increases proportionately. In a few hours the temperature falls to normal, and the patient may appear to be as well as she was previous to the attack. Another rigor, however, follows in from twelve to twenty-four hours, and is followed by others at shorter intervals, corresponding to the infection of hitherto exempted tissues by fresh emboli. Finally, the temperature fluctuates continuously between 100° F. and 106° F. (37.7°–41° C.).

In from three days to a week after the onset of the symptoms, metastatic abscesses may form. These may occur in any part of the body, but, as a rule, the disease follows one of two definite courses. Either the abscesses form in the superficial parts of the body, as in the joints, or subcutaneously; or they occur in the deeper organs,

as in the lungs, liver, kidney, spleen, and brain. The formation of each abscess is marked by the occurrence of rigors. The patient may gradually recover, but as frequently dies. Death may occur in several ways:—from exhaustion due to the long-continued suppuration; from septic pneumonia, peritonitis, or endocarditis; or from abscesses forming in vital organs, as the liver and the brain.

Prognosis.—The prognosis is very grave, but it is not quite as bad as in lymphatic sepsis. The more superficially the abscesses form, the better is the prognosis. From 50 to 60 per cent. of cases were formerly said to die, but this percentage has been lessened by operative treatment and the use of vaccines.

Treatment.—Support the patient's strength in every way. If there is any septic or sapræmic endometritis or vaginitis, it should be treated as has been described (v. pages 466, 475), and at the same time a diagnosis of the nature of the bacterial infection must be made. Vaccines, either alone, or in combination with sera, must then be regularly given as has been described (v. page 478). If abscesses form in joints they should be opened at once, in order to prevent, if possible, the destruction of the joint. If they form beneath the skin or muscles, they may be allowed to point before they are opened. In some cases hysterectomy may be of use, in order to remove the primary focus of infection, but it is necessarily a very serious operation when performed on a septic patient. Where there is septic thrombosis of the pelvic veins, their excision or ligature has often been successful in curing the pyæmia. Naturally the larger the veins, or the greater the number of veins involved, the more serious is the operation, and consequently the prognosis. Thus, while cases of septic thrombosis of one ovarian vein can be usually successfully treated,

cases of thrombosis of both internal iliacs are almost hopeless. We have successfully operated on one case of thrombosis of the right ovarian vein associated with pyæmia and pus formation in the lumen of the vein, and on a second case of thrombosis of the same vein associated with marked inflammation and thrombosis of the accompanying ovarian artery.

CHAPTER XXIX.

DISEASES ASSOCIATED WITH THE PUERPERIUM.

Pulmonary Embolus—Sub-involution of the Uterus—Mastitis: Varieties
Parenchymatous Mastitis—Interstitial Mastitis—Crural Phlebo-
thrombosis—Puerperal Insanity.

PULMONARY EMBOLUS.

PULMONARY embolus, occurring after delivery, is due to the detachment of a clot, most usually from the uterine sinuses, the clot being carried through the right side of the heart into the pulmonary artery.

Ætiology.—Extensive clotting is most likely to occur when the uterus has not contracted well after delivery. If clotting in the vessels has occurred, any slight movement may be sufficient to determine the detachment of the embolus.

Symptoms.—The onset of the symptoms is extremely rapid. The patient is perfectly well one moment, and the next she is collapsed, asphyxiated, her heart rapid and weak, her breathing frequent and sighing. The duration of the symptoms depends upon the size of the vessel plugged, and upon the strength of the patient. If a large vessel is obliterated, she will die in from a few minutes to a few hours. If the vessel is small, she may gradually recover.

Treatment.—The patient should be supported in a sitting posture by pillows, as in this position she will

breathe most easily. The action of the heart must be stimulated and strengthened by the hypodermic injection of strychnin and ether. Oxygen, if at hand, should be inhaled. Ammonia is especially recommended, both as a stimulant and on the ground that it may assist the absorption of the clot, or at any rate prevent further thrombosis. It may be given as the carbonate of ammonia in five-grain doses, or as the aromatic spirit in half-drachm doses, at first every hour and subsequently less frequently. If the right side of the heart is engorged, as shown by marked cyanosis and fulness of the superficial veins, venesection to the extent of a few ounces, or the application of leeches often gives considerable relief. Such remedies are, however, only of use when the vessel plugged is of small size; if a main trunk is involved, the prognosis is absolutely bad.

SUB-INVOLUTION OF THE UTERUS.

Sub-involution of the uterus is the condition in which the normal involution of the uterus does not occur, and in which an enlarged and relaxed uterus persists long after the organ should have returned to its normal unimpregnated condition.

Ætiology.—The causes of sub-involution may be briefly stated to include everything that predisposes to abnormal and persistent hyperæmia of the uterus during the puerperium. The most common of such conditions are too much exercise or work before uterine involution is complete; the presence of a backward displacement of the uterus; the retention of portions of placenta and membranes; and putrid or septic endometritis.

Symptoms.—The earliest symptom of sub-involution is the persistence of the lochia beyond the normal

period. Later, the symptoms consist in the occurrence of leucorrhœa, in constant backache and bearing-down sensations, and in the presence of an enlarged and soft uterus, which, as a rule, lies lower in the pelvis than it ought to, and which may be displaced backwards. In any case in which the lochia remain red after the tenth day, or in which the fundus is found above the level of the symphysis after the ninth day, sub-involution is the probable cause. In estimating the height of the fundus, however, it must be remembered that a loaded rectum or a full bladder may push the uterus into an unduly high position, and so make it appear to be enlarged.

Treatment.—The prophylactic treatment of sub-involution consists in the conduction of the third stage of labour in such a manner that placental fragments are not left behind in the uterus, in attention to the regular emptying of the bladder and rectum during the puerperium, in keeping the patient quiet for a sufficient period after delivery, and in correcting any displacements of the uterus that may occur.

If sub-involution is present, any causal factor must be removed, and the patient kept in bed. Hot vaginal douches may be administered daily, and if there is a persistence of red lochia, it is well to wash out the uterus also. If there is any reason to suspect that fragments of the ovum or decidua have been left behind, the uterus must be explored by the finger or a blunt curette, and the retained fragments removed. When the lochia still persist, and are principally composed of blood, we have obtained good results by the injection of half a drachm or a drachm of a fifty per cent. solution of formalin. This is injected by means of Braun's syringe. It is allowed to act for about thirty seconds, and the uterus is then washed out with water. All that

is desired is to obtain the momentary action of the formalin on the endometrium, and on no account must it be allowed to remain in the uterine cavity, as its caustic action is too great. Formalin causes uterine contraction, and also helps to bring about a healthy condition of the inside of the uterus by hastening the discharge of any remaining fragments of decidua. It may give rise to pain for a few hours, due probably to the contractions it induces.

In addition to the local treatment, ergot may be administered internally. As a rule, it is best to give a few fairly large doses of half a drachm or a drachm of the liquid extract, or a pill containing ergot and strychnin (Strychnin gr. $\frac{1}{30}$; Ext. Ergotæ, grs. iij), may be given night and morning for a week.

MASTITIS.

Mastitis is the term applied to inflammation of the breast.

Varieties.—It occurs in two chief forms :—

(A) Parenchymatous mastitis.

(B) Interstitial mastitis.

(A) **Parenchymatous Mastitis.**—This is the term applied to inflammation of the milk ducts and glands, *i.e.* of the parenchyma of the breast.

Ætiology.—Parenchymatous mastitis is due to the entrance of bacteria through the milk ducts. The bacteria may be derived from the milk, which has been allowed to dry upon the nipple, or infection may result from attempts made with septic fingers to form the nipples.

Symptoms.—The first symptom is the appearance of a patch of inflammation accompanied by considerable pain. As the infection is at first limited to the ducts,

and as, usually, only one set of ducts is infected, the area of inflammation corresponds in shape to the area from which the affected ducts come. Hence, it is triangular in shape, with the apex of the triangle at the nipple, the base at the periphery of the breast. There is a sharp line of demarcation between the healthy and the diseased portions of the breast. The inflammation usually tends to subside, but it may extend into the interstitial substance of the breast.

(B) **Interstitial Mastitis.**—This is the term applied to inflammation of the interstitial tissue of the breast.

Ætiology.—Interstitial mastitis may start by the extension of a parenchymatous mastitis; or, more commonly, bacteria may find their way directly into the interstitial substance through a crack at the top or the base of the nipple.

Symptoms.—An irregular and ill-defined patch of inflammation appears upon the breast; there is intense pain, and severe constitutional disturbance such as high temperature, rapid pulse, and general malaise. As a rule suppuration occurs, and an abscess is formed. The presence of pus is recognised not by fluctuation, which is difficult and sometimes impossible to obtain unless the abscess is very superficial, but by the presence of œdema over the site of suppuration.

Treatment.—The prophylactic treatment of mastitis should be adopted in all cases, but particularly with primiparæ. It consists in hardening the skin of the nipples in order to avoid subsequent laceration (v. page 106), and in instructing the patient in the duty of keeping her nipples clean. They should be washed both before and after the child takes the breast. Moreover milk should not be allowed to accumulate in the breast, if, for any reason, nursing is stopped. Such an accumulation, though not in itself sufficient to cause mastitis,

still provides a suitable nidus for any germs that may gain admittance. If a crack occurs on or round the nipple, it must be cured as quickly as possible. This is done by touching it lightly with nitrate of silver, or better still by painting it twice daily with Tr. Benzoin. Co. If *parenchymatous* mastitis occurs, the breast should be firmly bandaged to the chest wall, the nipple being first covered with a small piece of lint soaked in a fifty per cent. solution of Tr. Benzoin. Co. It is well also to administer a hydragogue purgative. If there is much pain, hot stupes and compresses will help to relieve it.

If we believe the mastitis to be *interstitial*, and pus to be likely to form, antiseptic compresses may be used to prepare the skin for incision. If an abscess forms, it must be opened immediately. The occurrence of œdema is a positive indication of the presence of pus, and it is unusual to obtain fluctuation. The following treatment of abscess of the breast is most successful:—Open into the most dependent part of the abscess by a radial incision, sufficiently large to admit the index finger. Let the pus drain out, and then pass in the finger, and with it break down all the diseased tissue. By this means the walls of the loculi in which the pus is stored are broken down, and one large cavity is formed. Next, curette the cavity with a large curette, choosing one which is not too sharp, and douche out thoroughly so as to wash away all the *débris*. Plug the cavity tightly with iodoform gauze, and bandage the breast as firmly as possible to the chest wall.

The gauze must be changed every twenty-four hours, and the cavity replugged, until the day comes when there is no pus on the gauze. This date varies from the second to the sixth day after opening the breast, according to the size of the abscess. Then the plugging

may be discontinued, with the exception of a small piece of gauze in the skin wound in order to keep it open. The breast is bandaged very tightly, so as to bring the walls of the cavity into apposition. After this it need not be dressed for three or four days. By this time the cavity will be completely obliterated, and a small superficial ulcer alone remains, which will take a week or so to heal completely. By adopting the above treatment, the worst mammary abscess can be completely healed in from two to three weeks, if care is taken to break down *all* the diseased tissue at the beginning.

CRURAL PHLEBO-THROMBOSIS.

Thrombosis of the veins of the leg is by no means an uncommon occurrence after delivery, and may be due to several different causes. In the first place, it may be a simple thrombosis due to the slowness of the circulation of the blood through relaxed veins. Such an occurrence is favoured by anything which weakens the heart's action, and by the presence of varicose veins. The clot may form in the femoral vein, or in the veins of the lower leg. The nearer the heart the thrombosis occurs, the greater will be the disturbance of the venous system of the affected leg, and the more marked the symptoms. In the second place, the thrombosis may be due to an inflammation of the inner coat of the vein. In the majority of cases, this phlebitis is the result of direct extension of infection along the walls of the vein from previously infected uterine sinuses. In a small proportion of cases, however, the phlebitis is localised, and is apparently not continuous with an infection in the uterine sinuses or pelvic veins. The ætiology of such cases is obscure.

In a certain number of cases, the lymph channels are obstructed as well as the veins, or perhaps they alone may be obstructed. Such an obstruction may arise from the extension of a lymphangitis from the pelvic lymphatics, or may be due to the compression of the main pelvic lymph channels by already thrombosed pelvic veins. Cases of lymphatic obstruction are probably always of infective origin, and are now not so commonly seen as they were formerly.

Varieties.—Phlebo-thrombosis of the leg thus occurs in two distinct varieties :—

(1) A primary and simple form, the result of slowness of the circulation through the veins.

(2) A secondary and septic form, the result of the extension of infection from the uterus along the walls of the vein, or of infective material circulating in the blood. In this form there may be an accompanying obstruction to the lymph channels.

Symptoms.—The symptoms common to both forms of venous obstruction are pain and swelling of the legs, in proportion to the size and situation of the obstructed vessel. The thrombosed veins, if superficial, can be felt as knotty cords beneath the skin. In the secondary septic form, pain as a rule precedes the swelling. It may start in the groin and then extend down the leg along the course of the infected veins, or it may be referred to a particular place on the thigh or calf. The leg is extremely tender to the touch, particularly over the infected vein. In some cases, localised areas of inflammation may appear along the course of the vein and subsequently break down into abscesses, or the position of the affected veins may be indicated by lines of slight inflammation, running down the thigh. In the condition known as *phlegmasia alba dolens*, or white leg, in which the lymphatics and

probably the veins also are affected, the leg may become of an enormous size, the skin is stretched and is white and glistening, and the pain is intense. If the engorgement is due to the obstruction of the lymphatics alone, the tissues of the leg have a peculiar brawny feel and will not pit upon pressure. If, on the other hand, there is also venous obstruction, the tissues are œdematous and pit on pressure.

In the primary form, there is little or no constitutional disturbance other than that due to the weakness of the patient. In the septic form, on the other hand, there are usually all the evidences of septic infection of a varying intensity. In some cases the symptoms may point to the presence of a septic endometritis or parametritis, in other cases to the existence of a pyæmic condition, while, in a few cases, there may be no definite signs of infection until the presence of thrombosis shows that it must be present.

Treatment.—The three main points in the treatment of both forms of thrombosis are rest in bed with the leg elevated, regulation of the bowels, and the administration of abundance of easily digested nourishment. Iron may also be given, and strychnin if the heart is weak. The leg must be carefully protected from the pressure of the clothes, particularly in phlegmasia, as in some cases even the slightest touch aggravates the pain. Some relief will be given by wrapping the leg in cotton-wool, and keeping the latter moistened with evaporating lead lotion. In septic forms, where there are localised areas of inflammation, the use of hot antiseptic compresses is preferable. In all cases sudden movements must be avoided, and in no case may friction of the leg be employed on account of the danger of detaching a clot. If abscesses form, they must be opened. Constitutional symptoms due to the infection must be

treated as has been already described, and suitable vaccines should be administered.

The patient must not be allowed to leave her bed for at least ten days after all fever, pain, and swelling have disappeared. Usually, however, as soon as she begins to walk, some pain and swelling of the leg will return owing to the uninjured veins not being as yet large enough to carry on the circulation when the woman is in the erect position. Indeed, it is probable that according to the size of the obstructed vessels it will be several months or a year before she is free from all pain, and that, for many years after, the pain and swelling will return to a slight extent after prolonged walking or standing.

PUERPERAL INSANITY.

Puerperal insanity is the term applied to a form of madness which sometimes occurs during pregnancy or the puerperium, or as a result of overlactation. It may last for the remainder of the patient's life, but in the majority of cases it is only a temporary affection.

Varieties.—Two varieties are met with:—

- (1) Melancholia.
- (2) Mania.

Frequency.—At the Rotunda Hospital, amongst 36,227 patients, the relative frequency of mania occurring during the puerperium was 1 in 646·91, of melancholia 1 in 5175·28.

Ætiology.—Insanity may be a primary condition, the result of heredity, alcoholism, or epilepsy; or it may be merely a symptom of sepsis.

Symptoms.—Mania rarely occurs except during the puerperium. Melancholia may occur at that time or during pregnancy, but is most frequent during the

puerperium as a result of septic infection, or later from overlactation. When either form occurs during the puerperium, its symptoms usually come on from two to twelve days after delivery. In *melancholia*, the patient is extremely depressed, and is frequently found in tears, without any apparent cause. This in itself should be sufficient to direct attention to her condition. If a patient is found to be continually fretting after delivery, without cause, she is probably suffering from either melancholia or sepsis, or perhaps from both. She is usually sleepless, and may have various delusions. In *mania*, the patient loses all idea of her surroundings, her mind is in a state of chaotic confusion, her moral faculties are affected. One moment she is extremely violent, the next passive and docile. She is the victim of delusions and illusions.

Treatment.—During pregnancy freedom from worry, fresh air and moderate exercise, good food, regulation of the bowels, and sleep are the essentials of treatment, and the patient should be, as a rule, separated from her husband and relatives. Constant watching to guard against suicide is necessary throughout. In severe cases it is usually necessary to send the patient to an asylum, unless careful nursing and frequent medical supervision can be provided at home. The induction of abortion or premature labour is rarely justifiable. The use of opium should be avoided, but small doses of chloral and bromides may be given if necessary. Simple tonics, and especially the gly-cero-phosphates, free phosphorus, or lecithin (from three to five grains in the day) are indicated, but, for the sake of the child, as few drugs as possible should be used.

During the puerperium, on the first appearance of suspicious symptoms, the infant must be removed, and the patient kept quiet, and under constant supervision

for fear of suicide. Attention must be paid to the breasts, and any evidence of septic infection must be treated as its form necessitates. The bowels should be freely opened by saline purgatives. The attack may sometimes be cut short at the outset by full doses of chloral or paraldehyde by the mouth or the rectum, so as to secure deep sleep. If these measures fail, the patient should be sent to an asylum without delay, unless skilled nursing and medical attendance is available. Separation from her husband and children is in all cases essential, and, if there is no improvement within six weeks, the patient should be sent to an asylum.

The recovery of the patient depends on efficient and early treatment, the most important part of which is suitable and sufficient food. Large amounts of liquid nourishment—eggs, milk, beef-tea, strong soups, plasmon, and the like, with cod-liver oil or malt-extract—must be given every few hours, both night and day, if necessary by the nasal or mouth tube. Malt liquors are particularly useful, and may be taken in large quantities. As purgatives, repeated and full doses of calomel, jalap, or even croton oil are well borne, and should be given if necessary. In order to induce sleep, paraldehyde, chloral with bromide, or sulphonal if there is much excitement, may be tried, but the use of opium or hyoscine must be avoided. Sponging, the wet pack, and prolonged warm baths are useful to relieve restlessness. If the temperature is high, from ten to fifteen grains of quinine should be administered every few hours, and, in cases of septic infection, vaccines must be administered.

When the stage of excitement is passing off, the patient should spend as much time as possible in the open air, and, in the later stages of the disease, the use

of Easton's syrup or a similar tonic and of iron is indicated.

If insanity starts during lactation the patient should always be sent away from home, but not necessarily to an asylum, save in the early and acute cases, and especially in the maniacal cases. Good nursing and constant watching are always necessary. The baby must be weaned at once. The bowels must be kept open with laxatives. Change, rest, fresh air, a generous diet, stimulants if required, baths and cold douches to the spine, moderate exercise as recovery progresses, and tonics, such as quinine, iron, and arsenic, constitute the treatment. Sedatives are to be avoided as far as possible, and sleep secured by fresh air, exercise, baths, and night-feeding. The use of paraldehyde, bromides, or sulphonal may sometimes be necessary, and in cases of marked depression, especially if accompanied by agitation, opium may give relief.

Prognosis.—More than half the cases recover within six months, but if there is any trace of hereditary taint, the patients are always liable to a relapse during or after subsequent confinements.

CHAPTER XXX.

ARTIFICIAL DILATATION OF CERVIX—INDUCTION OF ABORTION AND PREMATURE LABOUR.

Artificial Dilatation of Cervix, by Incision of the Cervix, by Dilatation of the Cervix—Induction of Abortion—Induction of Premature Labour: Methods: Version, Plugging of the Vagina, Catheterisation of the Uterus, Dilatation of the Cervix, Rupture of the Membranes.

ARTIFICIAL DILATATION OF THE CERVIX.

OBSTETRICAL dilatation of the cervix as distinct from gynæcological dilatation, can be obtained in one of two ways:—

- (A) By incision of the cervix.
- (B) By dilators.

By Incision of the Cervix.—Dilatation of the cervix, by means of multiple incisions, was introduced by Dührssen. It constitutes an easy and efficient way of obtaining the dilatation necessary for delivering the fœtus provided the whole supra-vaginal portion of the cervix is already fully dilated, and the defective dilatation is limited to the region of the external os. This condition is usually found only in primiparæ, as in them the supra-vaginal portion of the cervix dilates first (*v.* Fig. 44). In multiparæ, on the other hand, the supra-vaginal portion dilates at a later period of labour, and,

consequently, it is rarely possible to perform this operation (*v.* Fig. 45).

Indications.—Incision of the cervix is indicated in the following cases:—

(1) Stenosis of the vaginal portion of the cervix, which will not yield to the use of sedatives and hot douches (*v.* page 416).

(2) When immediate delivery is indicated, and the supra-vaginal portion of the cervix is dilated, but the vaginal portion is not.

Instruments.—The following instruments are necessary:—A posterior speculum; a stout blunt-pointed scissors; Martin's needle-holder; silk; whole-curved needles of medium and small size; two or three American bullet forceps.

Operation.—The patient is placed in the cross-bed position and the vagina is thoroughly douched. The posterior margin of the cervix is then seized with two American forceps, one a little to each side of the middle line. The piece of cervix lying between the forceps is then taken between the middle and index fingers of the left hand, the former finger in the vagina, the latter in the cervical canal. The fingers should reach right up to the vaginal insertion. The points of the scissors are then pushed along the fingers, and the cervix divided. Then the lateral margin of the cervix is similarly seized, each side in turn, and divided, and lastly the anterior margin. When there is extreme rigidity of the cervical tissues from structural change, it may be necessary to make additional incisions between the others. If so, they are made in a similar manner. Each incision can, as a rule, be made with two cuts of the scissors, and should extend right up to the vaginal insertion.

After the delivery of the child, the incisions should, if possible, be closed by sutures. This presents but little

difficulty, if the cervix is well depressed by traction with forceps and by pressure on the fundus. Each incision is closed by two or three sutures passed at right angles to it. The sutures should be removed in ten days. If it is found impossible to suture the incisions, the uterovaginal canal may be plugged with iodoform gauze, if there is any hæmorrhage.

(B) **Dilatation by Dilators.**—There are two classes of dilator which are intended for use in obstetrical cases. These are :—

(1) Metal dilators with four or more eccentric limbs, of which Bossi's dilator is the prototype.



FIG. 178.—Frommer's dilator, blades slightly separated.

(2) Hydrostatic dilators, of which Barnes' dilator is the prototype.

The best pattern of metal dilator for use in obstetrical practice is Frommer's modification of Bossi's dilator (*v.* Figs. 178, 179). As seen in the illustration, it consists of eight limbs, the points of which can be divaricated eccentrically by means of a screw handle. An indicator at the side shows the exact degree of dilatation which has been obtained. The limbs of the instrument are all detachable, and can be readily cleaned. The presence of eight limbs prevents undue pressure on the cervix at any point, and enables the cervix to be dilated gradually and without laceration. For this reason it has a manifest advantage over Bossi's dilator, which has only four limbs. Metal dilators of this type are said to offer the following advantages :—

- (1) They can be used in the case of a cervix in which neither dilatation nor taking up has begun.
- (2) They enable a sufficient degree of dilatation to be obtained to permit the delivery of a full-term fœtus.
- (3) They enable this degree of dilatation to be



FIG. 179.—Frommer's dilator, blades more widely separated.

obtained rapidly, if necessary in from fifteen to twenty minutes.

- (4) They excite uterine contractions, even in a uterus suffering from inertia.

These dilators are not used as much now as when



FIG. 180.—Champetier de Ribes' hydrostatic dilator.

first introduced. Good results can be got with care, but the dilators are sometimes dangerous and prone to cause laceration.

Two forms of hydrostatic dilators are in general use, Champetier de Ribes' and Barnes'. The former of these is preferable, as the manipulations necessary for

its use are less than in the case of Barnes' dilator. Champetier de Ribes' hydrostatic dilator consists of a conical bag made of inelastic water-proofed silk (v. Fig. 180). The base of the bag measures three and a half inches (9 cms.), and the bag tapers through a length of six inches (15 cms.) to a diameter of half an inch (1 cm.). It is slightly curved to suit the curve of the genital canal, and its fluid capacity is about twenty-two ounces (629 c.cs.). Barnes' hydrostatic dilators are



FIG. 181.—Barnes' hydrostatic dilator.



FIG. 182.—Syringe for filling Barnes' hydrostatic dilator.

fiddle-shaped rubber bags of varying sizes, the smallest of which is introduced first, and then removed to be followed in turn by the others according as the os dilates (v. Figs. 181, 182).

Indications.—Instrumental dilatation of the cervix is indicated in the following conditions:—

(1) Cases of pelvic contraction, when, owing to the early rupture of the membranes and the slow advance of the presenting part, the cervix is not dilating, and when delivery through the vagina is possible.

(2) Cases of cervical stenosis which will not yield to the use of sedatives and hot douches.

(3) When it is desired to effect rapid delivery in certain complications of pregnancy and labour, such as eclampsia, concealed accidental hæmorrhage, grave renal, pulmonary, or cardiac complications, and in the presence of a dead and putrid fœtus.

(4) Champetier de Ribes' dilator is recommended in certain cases of placenta prævia. We do not recommend its general use for this purpose.

Instruments.—If Frommer's dilator is used, no other instrument is required. If Champetier de Ribes' dilator is used, a slightly curved, narrow-bladed, and fenestrated forceps, for introducing the dilator, is also required.

Operation.—The patient is placed in the cross-bed position, and the vagina is thoroughly douched. If Frommer's dilator is used, it is passed closed through the cervical canal, and then by turning the handle the blades are very slowly and gradually divaricated. After each quarter or half turn of the handle, a couple of minutes' interval should be allowed, and the entire process of dilatation, in cases in which the os was completely closed, should take from forty-five minutes to an hour. The vagina should be douched from time to time with hot cyllin lotion during the process of dilatation, as this tends to increase the softness and dilatability of the cervical tissues.

If Champetier de Ribes' dilator is used, it is first sterilised by boiling, then folded along its long axis, caught in the forceps, and passed gently upwards through the uterine orifice. If the orifice is not of sufficient size to permit of the introduction of the forceps, it must be previously dilated with Hegar's dilators. If the uterine orifice is of sufficient size, it is

advisable to pass the tips of the fingers through the orifice, and to guide the forceps in between them. The bag should penetrate from four to four and a half inches (10 to 11 cm.) within the internal os. A new Higginson's syringe is then attached to the nozzle of the dilator and water pumped in. If one counts the number of bulb-fulls injected, and knows the capacity of the bulb of the syringe, one can always tell the amount in the bag at any time. Sterilised water, or water containing a weak antiseptic should be used for filling the bag. As the dilator fills, the forceps is gradually opened, and is withdrawn as soon as the size of the dilator is sufficient to prevent it from slipping out. According to the inventor, if 22·4 ounces (627·6 c.cs.) are injected into the dilator, the latter has a maximum circumference of 13 inches (33 cms.); if 18·9 ounces (510 c.cs.) are injected, of 10·6 inches (27 cms.); if 15·4 ounces (440 c.cs.) are injected, of 8·7 inches (22 cms.). As the circumference of the full-term foetal head is about thirteen inches (33 cms.), in vertex presentations the dilator will require to be filled to almost its full extent. As soon as the uterine orifice is of sufficient size, the dilator is expelled by the uterine contractions.

In addition to these two methods of obtaining dilatation of the cervix, two other methods, in common use in gynæcological practice, may sometimes be required in obstetrical practice. These are rapid dilatation of the cervix by means of Hegar's graduated dilators, and gradual dilatation by means of sea-tangle tents. As these methods are fully described in gynæcological hand-books, we do not consider it necessary to describe them here.

INDUCTION OF ABORTION.

Induction of abortion is the term applied to the bringing on of labour before the child is viable, *i. e.* before the twenty-eighth week. It is only justifiable under very exceptional circumstances.

Indications.—Abortion should be induced only in order to save the life of the mother. It is indicated in:—

(1) Cases of retroflexion of the pregnant uterus, which cannot be replaced.

(2) Certain diseases of pregnancy, as hyperemesis; and, perhaps, in exceptional cases of cardiac, renal or pulmonary affections.

(3) Cases of contracted pelvis, in which delivery through the vagina is impossible, and in which there is reason to consider that the life of the mother will be seriously endangered if the pregnancy is allowed to continue to full term. Such cases are very rare, as Cæsarean section, or pubiotomy at full term is usually possible.

Methods.—Before the formation of the placenta (*i. e.* before the fourth month), dilate the cervix, detach the ovum with the finger and express it as has been described (*v.* page 320). Dilatation may be started by means of sea-tangle tents, and completed by means of Hegar's dilators. From the fourth to the sixth month, puncture the membranes with a stilette. From the sixth month on, induce labour by Krause's method, as described under the "induction of premature labour" (*v.* page 506).

INDUCTION OF PREMATURE LABOUR.

Induction of premature labour is the term applied to the bringing on of labour any time after the child is viable, but before full term. As the operation is usually performed in order to save the child's life, it is almost useless to attempt it before the thirtieth week. The child is viable after the twenty-eighth week, but in practice the mortality among infants born before the thirtieth week is so high, that it is useless to induce labour, in order to save the child's life, before that time. Again, for cases of contracted pelvis, it is useless to induce labour after the thirty-sixth week. The transverse diameter of the child's head has reached its maximum size by this date, and labour induced after this will not procure an easier confinement, but will bring into the world a weaker child, than if the patient is allowed to go to term.

Indications.—Premature labour may require to be induced for any of the following reasons:—

- (1) Contracted pelvis measuring from $3\frac{1}{4}$ to $2\frac{3}{4}$ inches in the true conjugate.
- (2) Habitual death of the fœtus at some period after it has become viable, except when due to syphilis.
- (3) Ante partum hæmorrhage.
- (4) Hydramnios causing urgent heart symptoms.
- (5) Certain diseases of pregnancy, as hyperemesis; and, perhaps, in exceptional cases of cardiac, pulmonary and renal disease, and of eclampsia.
- (6) Delayed or missed labour.

Methods.—There are several methods of inducing premature labour, and no one method will suit every case. The method to be adopted depends upon the

indication for its adoption. Premature labour may be induced by the following methods :—

- (A) Podalic version, and rupture of the membranes.
Plugging the vagina.
- (C) Catheterisation of the uterus.
- (D) Dilatation of the cervix, digitally, with hydrostatic dilators, or with Frommer's dilator.
- (E) Rupture of the membranes.

(A) **Version.**—Version, followed by rupture of the membranes, is the method to be adopted in certain cases of placenta prævia, as it both checks the hæmorrhage and induces labour, which are the two things we require. This method will be discussed in full later (*v.* page 525).

(B) **Plugging the Vagina.**—This is the method to be adopted in certain cases of accidental hæmorrhage. Its action is similar to that of version in placenta prævia, *i. e.* it induces labour and checks hæmorrhage. It has been discussed in full (*v.* page 354). In addition to plugging the vagina, it has been also recommended to plug the lowest zone of the uterus with sterilised gauze soaked in ichthyol glycerine. To do this, the cervix must first be dilated by means of Hegar's dilators to a size sufficient to admit the finger.

(C) **Catheterisation of the Uterus.**—Catheterisation of the uterus with flexible gum-elastic bougies. This is Krause's method of inducing labour, and is perhaps the best method to adopt in cases of contracted pelvis or in any case in which there is no special complication—such as hydramnios or ante partum hæmorrhage—that requires special treatment. It is a very simple operation to perform, but is not free from risk, as it is very easy to infect the patient with sepsis whilst performing it. The operation can only be considered safe when it is performed under the most scrupulous aseptic precau-

tions. To perform it, the patient is placed in the cross-bed position, under an anæsthetic or not, as is thought best; the external genitals are shaved and thoroughly washed, and the vagina is well douched. The cervix is then exposed by passing a posterior speculum in order to prevent the bougies, while they are being introduced, from coming into contact with the vaginal wall, and the anterior lip is seized with a bullet forceps and drawn down. The cervical canal is then wiped out with a piece of cotton wool soaked in tincture of iodine, held on the end of a forceps. Two, three, or even four flexible gum-elastic bougies are then passed, one by one, upwards between the membranes and the uterine wall, as far as they will go. They should be passed in very gently and allowed to take their own direction. If they meet with any resistance, withdraw them, and pass them again in another direction. The ends of the bougies which protrude are then wrapped round with iodoform gauze soaked in sterilised glycerine, in order to protect the vagina. Labour may ensue in a few hours, or may not ensue for a few days. The bougies are taken out when the patient gets into strong labour, or when they have been in without result for twenty-four hours. In the latter case, after douching the vagina, a fresh set is introduced. If two or three sets have been introduced without result, the os should be dilated by Frommer's or by Champetier de Ribes' dilator; labour will then almost certainly ensue. If, as may happen in very rare cases, labour even then does not come on, the forceps must be applied if the uterine orifice is large enough, and if not, podalic version must be performed, and the leg of the foetus drawn down. Gentle and continued traction on this will effect dilatation of the orifice, and so enable delivery to be completed even if contractions do not occur. The bougies

used must be carefully sterilised. This is best done by boiling them for ten minutes, and then letting them lie for at least three hours in corrosive sublimate solution (1 in 500).

(D) **Dilatation of the Cervix.**—This is best practised in conjunction with Krause's method, if necessary. It can be performed digitally, by sea-tangle tents, by Bossi's dilator or by Frommer's modification, or by means of Barnes' or Champetier de Ribes' hydrostatic dilators. Digital dilatation is very liable to tear the cervix, and is not to be recommended. Dilatation at all is very rarely necessary, and, if it has to be performed, Champetier de Ribes' dilator is probably the best instrument to use, as its action resembles that of the unruptured membranes (*v.* page 502). In some cases Bossi's dilator, or other instrument of this type may be suitable, either as a means of obtaining complete dilatation, or sufficient dilatation to allow the introduction of Champetier de Ribes' dilator.

(E) **Rupture of the Membranes.**—This is the most simple method of inducing labour. Labour thus induced may, however, not start for some days, and before it starts, intra-uterine decomposition may occur, and necessitate the immediate emptying of the uterus. Also, even if labour starts satisfactorily, the dilating action of the membranes is lost, and so the labour is tedious. Rupture of the membranes is the best method to adopt in cases of hydramnios, as it at once relieves the cardiac symptoms due to the pressure of the large uterus.

CHAPTER XXXI.

THE APPLICATION OF THE FORCEPS.

Varieties of Forceps—Neville's Axis-Traction Forceps—Methods of using the Forceps—Conditions—Indications—Method of Application—The Forceps in Occipito-posterior Positions of the Vertex, in Face Presentation, in Brow Presentation, in Breech Presentation.

THE term "forceps," as used in midwifery, means an instrument adapted for seizing and extracting the head of the child.

Varieties.—There are two chief varieties:—(1) the short forceps, (2) the long forceps. The short forceps has only a single curve corresponding to the curve of the child's head. It is intended for use when the head lies low down in the pelvis, and is not suitable in any other case. As the long forceps will deliver the head in any position, the short forceps has been given up, as being a needless addition to the obstetrical armamentarium. The long forceps consists of two blades, an upper and a lower, each blade possessing two distinct curves—a cephalic curve, which enables it to be adapted to the child's head, and a pelvic curve, which enables it to be adapted to the curve of the pelvis. Students often find a difficulty in determining which is the upper, and which the lower blade. To do so, imagine your patient in front of you lying on her back. Then, hold the blade in your hand, in such a position that its pelvic curve corresponds with the pelvic curve of the mother. If

the lock of the blade is then uppermost, it must be the lower blade, as otherwise the other blade could not lock with it without crossing; if the lock is beneath, it must be the upper blade, for a similar reason.

There are many patterns of long forceps, both plain and with an axis-traction apparatus. An axis-traction forceps is one which has fitted to its blades an handles an appliance for applying traction in the proper direction. This appliance is called an axis-traction rod,

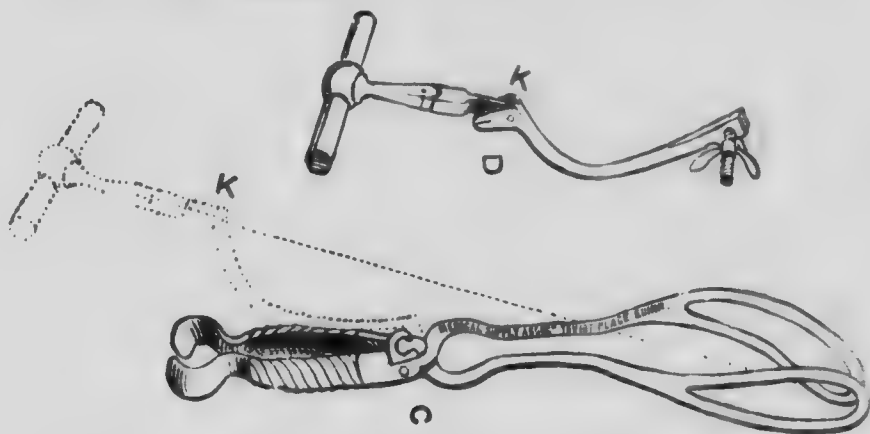


FIG. 183.—Neville's axis-traction forceps. c. Barnes' long forceps
d. Neville's axis-traction rod. κ. Arrow-head indicator.

and is so adjusted, that when pulling in the direction shown by an indicator or by the position of the handles, one is pulling in the axis of the pelvis. Everyone prefers the pattern of forceps to which he is accustomed; but, to anyone who is buying his first forceps, we strongly recommend Barnes' long forceps with Neville's axis-traction apparatus adjusted to it (v. Fig 183). The great advantage of this pattern is that the traction apparatus is entirely outside the vagina when the forceps is applied; that it is uncomplicated; that it is a true axis-tractor; and that the forceps can be used with or

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without the traction apparatus as desired. In choosing one of these forceps the points that should be observed are:—

- (1) That the arrow-head indicator is parallel to the penetrated portion of the blades.
- (2) That the forceps is not too flexible.
- (3) That the portion of the blade which comes in contact with the child's head is flat, or even very slightly concave never convex, as it is often made.

The forceps should be only used as a compressor. It is useless to use it as a compressor in order to increase the diameter of the child's head. The sizes of the pelvis; and, if it is made to compress the head, it causes a compensatory increase in the diameter of the latter which lies in the conjugate diameter of the pelvis, *i. e.* in the diameter which most requires reduction. This is especially the case when the head is above the brim, and it is one of the reasons for not using the so-called "high forceps" operation. It is then impossible to avoid compression. The forceps should not be used as a lever, *i. e.* by giving it leverage movements to the handle, as, by so doing, the mother's soft parts are liable to be injured and considerable harm may be done.

Indications. The indications for the use of the forceps may be divided into two groups:—

- I. Indications on behalf of the child.
 - II. Indications on behalf of the mother.
- I. In the first group are included:—
 - (1) A foetal heart-rate rising progressively above 160 in the interval between the pains, or falling below 120.
 - (2) Tumulous movements on the part of the

(3) The coming away of meconium, unmixed with liquor amnii, in a head presentation.

(4) Prolapse of the cord (*v.* page 433).

II. In the second group are included :—

(1) Accidental hæmorrhage (*v.* page 356), and placenta prævia (*v.* page 362).

(2) Threatened rupture of the uterus (*v.* page 453).

(3) Unduly prolonged second stage, as shown by the exhausted condition of the patient.

(4) Convulsions (*v.* page 313).

(5) Cardiac, pulmonary, or renal disease.

(6) Hæmatoma of the vulva (*v.* page 449).

The foregoing indications must not be regarded as all equally absolute. Provided the conditions necessary for the safe application of the forceps are fulfilled, they are all absolute, because the forceps then furnishes the best means of delivering the fœtus with the least risk to it and to the mother. If, however, these conditions are not fulfilled, then it is necessary to decide whether the danger incurred by waiting is so great as to necessitate the immediate delivery of the fœtus, and, if it is so great, whether the forceps offers the best means of effecting delivery under the circumstances.

For the safe and easy application of the forceps, the following conditions must be fulfilled :—

(1) The uterine orifice must be sufficiently dilated to allow the passage of the fœtus. If it is not so dilated we are using the forceps not alone as a tractor, but as a dilator, and, if dilatation is necessary, it is always preferable to effect it as has been described (*v.* page 497), and then to apply the forceps, rather than to drag the foetal head through an imperfectly dilated orifice and to run the risk of causing deep lacerations of the cervix. If, as sometimes happens, the forceps must be applied through an imperfectly dilated orifice, traction must

be made with extreme slowness and gentleness, in order to avoid laceration.

(2) The foetus must present by the vertex, or posterior fontanelle, or, if the face presents, the chin must have rotated forwards. In other presentations of the head, it is doubtful whether the forceps offers a better prospect of effecting delivery than do the unaided uterine contractions, and probably it is only when the latter are feeble that the forceps will prove of service.

(3) The greatest diameter of the head must have entered the pelvic brim. Even in a normal pelvis and with an axis-traction forceps, there is always a difficulty in pulling a head which is free above the brim into and through the latter. It must be remembered that an axis-traction forceps only enables one to pull in the direction of the axis of the upper half of the blades of the forceps. If this portion of the blades lies in the axis of the pelvic inlet, then our traction will correspond with that axis, but if the blades do not so lie, then our traction may not be made in the axis of the inlet. If the head is fixed in the brim, the pelvic curve of the forceps, and the manner in which the forceps adapts itself to the head, ensure that, for all practical purposes, the axis of the blades lies in the required position, but when the head is free to move about above the brim there is no certainty that it will so lie. Rather, there is the extreme probability that we are wasting a certain amount of energy in pulling the head against the symphysis. Further, if the head is lying at the brim in an asynclitic position (*v.* page 157), the forceps tends to drag it downwards in this position, and prevents it from gradually correcting itself, as it would do if the uterine contractions alone were acting upon it. Lastly, if the head is free above the brim when there is an indication for immediate delivery, it is probable that

there is a disproportion between the head and the brim; and this disproportion is bound to be increased by the lateral expansion of the head that results when the blades of the forceps drag the base of the skull downwards, and the rigid pelvic ring presses the sides of the skull upwards. On the other hand, if the non-fixation of the head is due to weak uterine contractions and not to extreme disproportion, delivery may be safely effected by means of the forceps.

(4) Uterine contractions must be occurring with sufficient regularity and force to ensure the subsequent detachment and expulsion of the placenta, and the closure of the uterine sinuses. If there is uterine inertia, the danger of post partum hæmorrhage is considerable, although in some cases delivery by the forceps appears to stimulate the contractions. Uterine inertia is frequently given as an indication for the application of the forceps, but we consider it more correct to regard it as a contra-indication to their use. The presence of uterine inertia may necessitate, but it never indicates, the use of the forceps.

Method of application.—The forceps may be applied with the patient on her side, or on her back. Personally we have of late years always adopted the dorsal position, and consider it to be preferable, but as the side position is usually adopted in this country, we shall describe it also.

The patient is placed in the dorsal cross-bed position, her legs held by an assistant sitting at each side, or, if two assistants are not available, a chair is placed under each foot. If the patient is under an anæsthetic, the legs can be conveniently kept in position by means of a sling which passes round her neck, and each end of which is tied round the flexed knee sufficiently tightly to keep the legs flexed in the required position.

As soon as the patient has been thoroughly washed, disinfected, and anæsthetised, the bladder is emptied with a catheter and the membranes ruptured. A careful vaginal examination is then made to determine the exact presentation and position of the head and its relation to the pelvis, the condition of the cervix, and the presence of any abnormality of the pelvic walls or the soft parts.

There are two methods of applying the forceps, both of which have their advocates. The first consists in applying it in relation to the pelvis, so that the forceps always lies in relation either to the transverse or to the oblique diameter, and that consequently its pelvic curve always corresponds more or less exactly with the curve of the pelvis no matter what the position of the head. The second method consists in applying it in a fixed relation to the head whatever may be its relation to the pelvis. Thus, in a vertex presentation, the forceps is so applied that the blades lie along each side of the head, the long axis of the forceps corresponding as closely as possible with the supra-occipito-mental or the occipito-mental diameter of the head (*v.* Fig. 184). The latter method is, undoubtedly, the more correct, and is the method which will allow the head to be extracted with the least force.

Every obstetrician has been brought up to practise one or other method, and he will probably adhere to that with which he is most familiar. It is important to remember that in the majority of cases there is no essential difference between the two methods, and that it is only in atypical positions of the head that the one method differs from the other. These are, however, just the cases in which difficulties often arise, and in which every manœuvre that facilitates delivery is of assistance. For this reason, we advise the student to

learn both methods, and, in all cases, so far as possible, to try to apply the forceps in whatever manner enables the head to be delivered with the least amount of force.

The Pelvic Method.—When the patient lies in the dorsal position, the left or lower blade of the forceps is taken in the left hand, and the right hand is passed into the vagina and upwards into the hollow of the sacrum behind the head, and the fingers are slipped inside the lips of the cervix, if any portion of the latter can be

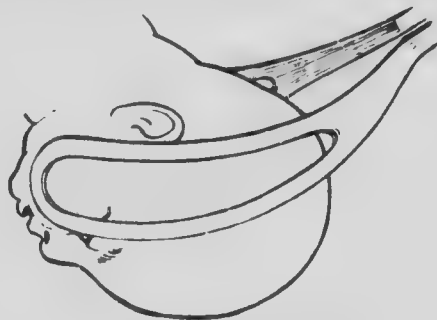


FIG. 184.—The manner in which the forceps should grasp the head in a vertex presentation.

felt. It is essential to introduce the hand so far as is necessary to make certain that the taking up of the cervix is complete, as otherwise the blade may be passed outside the cervix, and so include the latter between it and the foetal head. If this happened, as soon as traction was made we should be dragging down not only the head, but also the uterus, and most serious, if not fatal, consequences might result. The blade is then passed through the vulva, and the point is slipped upwards along the palm of the hand until it has passed above the greatest convexity of the head. The handle is then gently rotated, so that the blade travels round the head and comes to lie at the left end of the trans-

verse diameter of the pelvis. The handle is then carried further backwards and towards the middle line, a movement which has the effect of carrying the blade higher into the pelvis and more fully round the greatest convexity of the head. This blade is now in position, and is maintained there either by an assistant or by slight pressure with the palm of the hand in the vagina. The right or upper blade is next taken in the right hand, the



FIG. 185.—The method of applying the lower blade to the head.

left hand being passed into the vagina, and is introduced in a similar manner except that the rotation of the handle is made in the opposite direction, so as to bring the blade to lie in relation to the right end of the transverse diameter of the pelvis. The handles are then crossed and interlocked.

We have said in our description that the blades are brought to lie at the opposite ends of the transverse diameter of the pelvis, but, as a matter of fact, they rarely remain in this position. If the head lies with its antero-posterior diameters corresponding to one oblique

diameter, the forceps tends to slip round until it lies in the opposite oblique diameter.

If the forceps is applied with the patient in the left lateral position, she should lie with her buttocks projecting slightly over the edge of the bed, and her thighs and legs flexed. During the introduction of the blades an assistant must hold the right leg with the knee raised, but, as soon as traction is begun, she should sit on the bed behind the patient's back, and bringing the left hand round the thigh from inside and the right hand round from outside, clasp them firmly so as to encircle the thigh at the fold of the nates. In this position she can provide the necessary counterstrain to the traction exerted by the operator, and so prevent the patient from slipping too far off the bed. The left lower blade is still introduced first, but it is held in the right hand, while the left hand serves as the vaginal guide. This hand is kept in the vagina, the right or upper blade also being held in the right hand.

The Cephalic Method.—The cephalic method of applying the forceps is as follows:—Introduce as much of the hand as is necessary into the vagina, and determine the position of the posterior ear. Then, apply over that ear the corresponding blade of the forceps. If the ear is directed to the left side of the pelvis, apply the left blade; if to the right side, apply the right blade. If the head lies transversely, apply the left blade when the occiput points to the left, and the right blade when the occiput points to the right, so that when rotation occurs the forceps may rotate into its proper relation to the pelvis. If the head lies antero-posteriorly, and, consequently, neither ear is posterior, apply the left blade first over the ear which is directed towards the left side. As soon as this blade is in position apply the second blade over the opposite ear. The blades are

guided into position by means of a hand in the vagina passed upwards beside the head, as has been described. If the patient is lying on the left side, the left hand is introduced in each case into the vagina. If the patient is lying on the back, the right hand is introduced when the left blade is being applied, the left hand when the right blade is being applied. In all cases, we try to make the forceps lie with the blades over the ears, and with its long axis corresponding to the occipito-mental or sub-occipito-bregmatic diameter of the head (*v.* Fig. 184). When the right blade is applied first a slight difficulty will arise, since, when the left blade is introduced, it will lie above the right, and the locks will not fall together. This difficulty can be overcome by rotating the left handle round the right handle, and so bringing them into their correct relation.

The forceps having been applied by whichever method is thought best, the next point is to extract the *foetus*. As soon as the blades have been locked the axis-traction apparatus is applied, the butterfly nut that holds the blades together is screwed up just sufficiently tightly to prevent the blades from falling apart, and traction is applied. Traction should be made with one hand at first, and only in the event of this proving insufficient should both hands be used. Traction is made intermittently, and, if uterine contractions are occurring, should be made concurrently with them. The direction in which to pull is shown by the indicator on the axis-traction apparatus. If the head is entering the brim, we first pull downwards and backwards in the axis of the inlet. Then, as the head passes into the pelvic cavity, we pull almost directly downwards, then directly downwards, then, as the head approaches the outlet, downwards and forwards, and, lastly, as the head emerges, almost directly forwards. As the head is passing over

the perinæum the forceps may be removed, or be allowed to remain. Personally, we do not consider that it is a matter of much importance which course is adopted. The advantage of removing the forceps is that the head, when born, is free, and the forceps is out of the way.

If Tarnier's or Milne Murray's forceps is used, we must apply traction in such a manner that the rods of the traction apparatus are always close to the handles of the forceps. If a forceps without any axis-traction



FIG. 186.—The forceps applied to the head in the pelvic cavity, showing the manner in which traction is applied.

adjustment is used, we must pull so as to suit the curve of the parturient canal. That is, if the head is at the brim, first, downwards and backwards; then downwards; then downwards and forwards; and finally, almost straight forwards.

Extraction by the forceps in *occipito-posterior position* of the vertex is always more difficult, and requires the exertion of more force than is necessary in a normal position of the head. In such cases the forceps should be avoided if possible, as serious lacerations of the soft parts are liable to occur. During extraction, the head

may rotate so that the occiput comes to lie beneath the pubes. If this happens, the forceps must be removed and re-applied. If the occipito-posterior position persists, the forceps must be carried well forward over the mother's abdomen until the occiput is born, and then in the opposite direction as the face slips from behind the perinæum. The last named is very frequently torn in these cases.

In *face presentation*, the forceps is of little use, except when the non-delivery of the child is due solely to uterine inertia. It may also be tried as a last resource, before performing perforation, when there is an absolute indication for delivery on the part of the mother, if the child is alive, and if the chin has not rotated posteriorly. It must always be so applied that the blades grasp the sides of the head, as otherwise the pressure of a blade on the neck would probably kill the child. For this reason it is difficult to apply the forceps satisfactorily in face presentation unless the head is low in the pelvis.

In *brow presentation*, the forceps is contra-indicated. The brow is much more likely to become changed during labour into a face or a vertex, if delivered by uterine contractions alone, than if the forceps is applied (*v.* page 214). The forceps, however, may have to be used under similar conditions to those in a face presentation, provided that the forehead has rotated in front.

In *breech presentation*, the forceps is liable to slip, and also to harm the child. It is better to extract an impacted breech by other means (*v.* page 532).

CHAPTER XXXII.

VERSION—ARRESTED BREECH—IMPACTED SHOULDERS.

Version : Varieties—Cephalic Version : Indications, Methods, External Version, Bipolar Version—Podalic Version : Indications, Methods, External Version, Bipolar Version, Internal Version—Contraindications to Version—The Extraction of the Fœtus in Pelvic Presentation—Impacted Shoulders.

VERSION.

VERSION is the term applied to the operation by which one polar presentation is substituted for another, or a polar presentation is substituted for a transverse presentation. There are two varieties of version, each named after the resulting presentation :—

- (I) Cephalic version.
- (II) Podalic version.

There are three methods of performing version :—

- (1) External version, in which the presentation is changed by external manipulations alone.
- (2) Combined internal and external version, in which the presentation is changed by means of two fingers of one hand introduced into the uterus, assisted by the other hand externally on the abdominal wall.
- (3) Internal version, in which the presentation is changed by means of one hand introduced into the uterus.

I. CEPHALIC VERSION.—The operation of cephalic version consists in changing the original presentation of the child into a head presentation.

Indications.—Cephalic version is indicated in faulty presentations of the child, under the following conditions:—

- (1) If rapid delivery is not required.
- (2) If there is nothing to prevent the child's head engaging in the pelvis.
- (3) If the presenting part is not fixed.

Methods.—It can be performed by—

- (A) External manipulation, Wigand's method.
- (B) Combined external and internal manipulation, Braxton Hicks' method.

(A) **External Cephalic Version.**—To perform external cephalic version, we require a lax abdominal wall and unruptured membranes. If the patient strains, she must be anæsthetised. As soon as the abdominal walls are lax, ascertain by palpation the exact position of the foetus; and, by a series of pushing movements, press the head in whatever direction will bring it over the pelvic brim by the shortest route, at the same time pressing the breech in the opposite direction. Then, if the os is nearly dilated, rupture the membranes; and either hold the head over the brim until the uterine contractions cause it to fix, or—which will have the same effect—apply a binder tightly round the patient's abdomen. It is not much use to turn the foetus before labour has begun, as it would probably slip back into its original position.

(B) **Combined Cephalic Version.**—Cephalic version, by the combined method of Braxton Hicks, may be performed before, or soon after the membranes have ruptured. To perform it, introduce as much of the hand into the vagina as is necessary, and push the

presenting part upwards out of the brim, and towards the side opposite to that at which the head is lying. If the head lies towards the right side of the patient, use the left hand, and *vice versa*. Then, with the other hand on the abdominal wall, press the head down, and ensure its remaining there by the same means as in external version.

II. PODALIC VERSION.—This is an operation which is far more frequently required than is cephalic version. It consists in changing the original presentation of the child into some variety of pelvic presentation, and most frequently into a footling presentation, by drawing down a foot.

Indications.—Podalic version is indicated:—

- (1) In certain cases of malpresentation of the head, *i. e.* face and brow presentations (*v.* pages 208 and 215), and posterior parietal presentation (*v.* page 183).
- (2) In certain cases of prolapse of the cord (*v.* page 432).
- (3) In most cases of placenta prævia (*v.* page 361).
- (4) In certain cases of contracted pelvis (*v.* page 404).
- (5) In transverse presentation, in which cephalic version has either failed or cannot be performed (*v.* page 247).

Methods.—Podalic version can be performed by:—

- (A) External manipulation only, if it is not necessary to bring down a foot.
- (B) Combined internal and external manipulations.
- (C) Internal manipulation.

(A) **External Podalic Version.**—External podalic version can be performed under the same conditions as external cephalic version,—namely, lax abdominal walls,

the presenting part unfixed, and unruptured membranes. It is performed in exactly the same manner as cephalic version, except that the breech, instead of the head, is brought over the pelvic brim.

(B) **Combined Podalic Version.**—The usual indication for combined or bipolar version, is placenta prævia. To perform the operation, we require lax abdominal walls, unruptured membranes, the presenting part not fixed, and an os which is sufficiently dilated to admit at least two fingers. An anæsthetic is almost always necessary, as the danger of prolapse of the cord is very great if the patient strains. Place the patient in the cross-bed position, ascertain by palpation the exact position of the child, and then turn the child by external version into a transverse presentation. The child must be turned in such a direction that its back will be towards the fundus of the uterus, and its abdomen towards the pelvic brim. If this is done, the foot will be found lying in the neighbourhood of the internal os.

Then introduce the whole hand into the vagina, and two fingers into the cervix, rupture the membranes, and with the hand on the abdomen press the breech downwards; the foot can then be seized and brought out into the vagina. This is easily accomplished if the os is fairly well dilated. In some cases, however, the os may be quite large enough to admit two fingers, or to allow the foot to descend by itself, but it may not be large enough to allow all three to pass through it at the same time. If this is so, proceed as follows:—Having passed the fingers into the uterus and seized the foot, draw the latter down until the toes are through the os internum. Then, draw the fingers gently back into the vagina, and try to push the cervix upwards over the foot, at the same time pressing upon the breech through the abdominal wall, so as to cause the foot to descend

(v. Fig. 187). When half the foot has by this means been brought into the vagina, seize it and draw it downwards. Lastly, with the hand on the abdomen push the head up to the fundus. If the foot cannot be drawn down in this manner, it may be caught with a bullet forceps and so drawn down. If the side of the foot is



FIG. 187.—Method of completing bipolar version in a case in which the size of the os will not permit of the presence of the foot and the two fingers at the same time. The hand in the vagina pushes the cervix upwards while the foot is made to descend by pressure upon the breech.

caught and care is taken to avoid a bone, the pressure and punctures of the forceps will do little harm.

(c) **Internal Podalic Version.**—Internal podalic version can be performed:—

- (1) If the os is sufficiently dilated to admit the entire hand into the uterus.

(2) If the presenting part is not too firmly fixed to be displaced.

(3) If no contra-indication to version exists.

The operation can be most easily performed with the patient upon her back. Begin by ascertaining the exact position of the child by palpation. If the case is one of transverse presentation, and if the legs are on the right side of the mother, introduce the right hand into the vagina. If the legs are on the left side of the mother, use the left hand. In a head presentation, the right hand is preferable for every position of the child, except when its limbs are to the right and in front; under such circumstances the left hand is more suitable. If the operation has to be performed with the patient lying on her side, place her upon the side at which the limbs are, whatever the presentation of the foetus, and introduce the opposite hand into the vagina; that is to say, if the limbs are on the left side, place the patient on her left side, and introduce the right hand.

Having introduced the hand, seize the first foot that can be felt, and draw it downwards and towards the opposite side of the pelvis (*v.* Figs. 188 and 189). The child is now lying with both head and breech in the lower part of the uterus. The last step of the operation consists in pushing the head up to the fundus, and at the same time drawing the foot down deeper into the vagina. This may be very easy, or it may be extremely difficult, or even impossible, according to the degree of force with which the uterus has contracted down upon the child. This is the most difficult step of the operation in cases of neglected shoulder presentation. Under such circumstances, if the head cannot be made to rise to the fundus, as has been described, bring down the other foot and make traction on both feet. If this is still unavailing, a simple and often successful expedient

is as follows:—Make a slip-knot on a strip of iodoform gauze, sufficiently long to extend outside the vulva, and pass it upwards round the ankle of one or both feet.



FIG. 188.—Internal version.—The right foot is caught and drawn down.

Seize the strip with one hand outside the vagina, and pull upon it; while, at the same time, the other hand in the vagina pushes the head upwards out of the false pelvis (v. Fig. 190). If this fails, embryotomy in some

form will be necessary, as the child cannot be delivered if it is allowed to remain in this position.



FIG. 189.—Internal version.—Showing the effect of drawing the foot still further downwards into the vagina. The dotted outline on the right shows the left hand pushing the head upwards.

If an arm is prolapsed into the vagina, it is well to slip a noose of gauze over it, in order to prevent it from

subsequently becoming extended and pushed up beside the head during delivery : beyond this, pay no attention



FIG. 190.—Method of completing a difficult case of internal version, by means of a gauze fillet

to it at first, but draw down the foot as directed. It is unnecessary to try to push the arm up out of the vagina, as it will automatically slip upwards as the head ascends to the fundus.

It will be seen that internal version is also "combined," in that the process is performed by the use of both hands, one inside the uterus, the other on the abdominal wall. The real difference between combined version and internal version, so-called, is that in the former only two fingers are introduced into the uterus, in the latter the whole hand.

Difficulties in the performance of internal version may be caused by:—

(1) Not having ascertained the exact position of the child at the beginning of the operation.

(2) Insufficient dilatation of the cervix. This can be overcome, if necessary, by the use of Frommer's or Champetier de Ribes' dilator (v. page 499).

(3) Passing the hand outside the membranes instead of inside.

Contra-indications.—Version is contra-indicated by the presence of certain conditions:—

(1) If the contractions of the uterus have been so strong that the foetus is in great part expelled from its cavity. In such a case, in order to turn, the expelled portion of the foetus would have to be replaced in the uterus, and there is not room for this.

(2) If it is obvious that the child cannot be delivered without embryotomy or craniotomy, even after version. Perforation of the after-coming head is a more difficult operation than perforation of the head coming first, especially in the case of a contracted pelvis.

(3) If the membranes are long ruptured, and the retraction ring is more than two and a half inches (6 cms.) above the symphysis (Winckel). In this case, rupture of the uterus would most probably result.

THE EXTRACTION OF THE FŒTUS IN PELVIC PRESENTATION.

The different procedures, for the extraction of the foetus in pelvic presentation, are analogous to the application of the forceps in cephalic presentation. Consequently, the indications for these procedures are similar to those for the application of the forceps (*v.* page 511).

Methods.—The extraction of the foetus in pelvic presentations consists of three distinct procedures:—

- (1) The extraction of the pelvic pole.
- (2) The liberation and delivery of the arms.
- (3) The extraction of the head.

We have already described the last two procedures (*v.* pages 232—238), and, consequently, here we need only describe the first.

If the breech is delayed at the brim, and pressure upon the fundus during the contractions fails to make it advance, bring down a leg. To do so, place the patient in the cross-bed position, introduce the hand into the vagina, and slip two fingers upwards into the uterus along the anterior thigh. If the child is lying with its knees flexed, the foot will be found near the buttock, and can be seized and drawn down. If, on the other hand, the knees are extended, slip the fingers still further down the thigh, until the knee is reached; and then, by pressure upon the anterior aspect of the leg just below the knee, the leg is made to flex upon the thigh, and so brought down. If the leg is got down, it diminishes the size of the presenting part, and gives a means by which to apply traction. We must take special care to get below the knee before trying to flex the leg, otherwise there is great danger of fracturing the femur.

If the leg cannot be brought down, owing to the breech having become impacted in the pelvic cavity, we must resort to traction upon the groin. With the patient in the same position, slip two fingers into the angle of the anterior groin, one above the other, and apply traction in the pelvic axis, at the same time trying to assist anterior rotation. By this means, the breech is brought sufficiently low to enable us to pass the fingers into the posterior groin, and then, by pulling alternately on one and the other, the child is extracted. The power of the fingers, which are used to make traction on the groin, can be greatly increased by grasping the wrist firmly with the other hand during the traction.

If the impacted breech still resists our efforts, try to pass a fillet of iodoform gauze over the anterior groin. This can be done as follows:—Take a small piece of double gauze about eighteen inches long and two inches wide, and rolled like a bandage. The free end of this roll is held in the left hand, and the roll itself is pushed upwards between the thigh and the anterior pelvic wall, in such a manner that, as it advances, it unrolls. As soon as it has been pushed above the angle of the groin, it is pushed inwards across the latter until it comes to lie between the thighs. Then, the fingers are pushed upwards from below between the thighs, and the roll of gauze caught and drawn downwards. If the first piece of gauze which was introduced is not sufficiently strong, a stouter piece can be knotted to one end of it and drawn over the groin. Traction is then applied to the ends of the gauze, taking care that the gauze comes well down into the groin, and that there is no outward strain on the femur.

Another method of applying the gauze is by using a catheter as a *porte-fillet*. Take an ordinary No. 10 or 12

gum-elastic catheter with a strong stilette, thread it with a piece of stout sterilised silk or twine, and bend its upper end into a semicircle corresponding in size to the circumference of the thigh. Then, slip the catheter upwards anteriorly until the tip can be guided over the groin, and lies somewhere near the symphysis of the fœtus. Hold the stilette by the ring, and push the catheter itself gently upwards, and the curve which has been given to the stilette will guide the tip of the catheter downwards between the thighs, where it can be reached with the fingers. The end of the silk is caught and knotted to a piece of gauze, which is then drawn up to the eye of the catheter by means of the silk. The catheter and stilette are next gently withdrawn, and, at the same time, the gauze is carried over the groin.

If the child is dead, and extraction difficult, a cephalotribe may be applied to the breech; or, if one is not at hand, the forceps tightly screwed up may be used instead. A blunt hook is a dangerous instrument for extraction. Even in skilful hands, it may break the femur of the child, or tear the femoral vessels; whilst in unskilful hands, much damage may be done to the uterus or vagina. As soon as the breech of the child has passed the vulva, the case is managed like an ordinary breech presentation.

THE DELIVERY OF IMPACTED SHOULDERS.

The shoulders sometimes become impacted in the pelvis after the birth of the head, either owing to their size or to their failure to rotate. The treatment of this condition has been already discussed (*v.* page 423).

CHAPTER XXXIII.

CONSERVATIVE CÆSAREAN SECTION — RADICAL CÆSAREAN SECTION — EXTRA-PERITONEAL CÆSAREAN SECTION—PUBIOTOMY.

Conservative Cæsarean Section: Indications, Method—Radical Cæsarean Section: Indications, Operations—Extra-peritoneal Cæsarean Section—Pubiotomy: Indications, Operation.

CONSERVATIVE CÆSAREAN SECTION.

CONSERVATIVE Cæsarean section is the term applied to the operation by which the abdomen of the mother is opened, the uterus incised, the child extracted through the opening thus made, and the uterus stitched up, and replaced in the abdomen. It thus differs from radical Cæsarean section, sometimes called Porro's operation, in which, after the extraction of the child, the uterus also is removed.

Indications.—The indications for Cæsarean section may be divided into two classes :—

(A) **Absolute indications**,—when abdominal section is the only means by which the child can be delivered. These indications are :—

(1) Absolute pelvic contraction, *i. e.* below two and a quarter inches (5.5 cm.) in the true conjugate in a flat pelvis, or below two and a half inches in a generally contracted pelvis.

(2) Solid irremovable tumours blocking the pelvis ;

as,—bony growths from the pelvic walls, myomata of the uterus, cancer of the cervix, or ovarian tumours.

(3) Extreme cicatrisation of any part of the vagina, sufficient to prevent it from being dilated without the rupture of other organs (Winckel).

(B) **Relative indications**,—when the child can also be delivered by some other operation, such as pubiotomy, perforation, or induction of premature labour, and when the adoption of Cæsaean section depends upon such circumstances as the period of pregnancy, the condition of the child, and the will of the mother. These indications are:—

(1) Lesser degrees of pelvic contraction, *i. e.* pelvis which measure from $2\frac{1}{4}$ to $3\frac{1}{4}$ inches (5·5–8 cm.) in the true conjugate in a flat pelvis, and from $2\frac{1}{2}$ to $3\frac{1}{2}$ inches in a generally contracted pelvis, provided that the child is alive.

(2) Partial obstruction from solid tumours as above, if the child is alive.

Method.—In a book of this size only a short outline of the operation can be given. It should be performed whenever possible before the patient has come into labour and before any vaginal examinations have been made. The uterus almost invariably contracts well after it has been emptied, even though previous contractions have not occurred. If the necessity for its performance has not been recognised until the labour has begun, then the sooner it is done the better. The later in labour it is performed the greater the risk, and consequently the worse the prognosis. For the performance of the operation, four assistants are advisable;—one to give the anæsthetic, one to take charge of the infant after its extraction, and two to assist the operator. The steps of the operation are as follows:—

(1) Open the abdomen in the middle line by means

of an incision eight inches (20 cm.) in length, one-third of which lies above the umbilicus, the remainder below; the uterus appears in the wound. If we believe the cavity of the uterus to be infected, the abdominal incision must be longer, and the uterus should be brought out through it on to the anterior abdominal wall. In this way infection of the abdominal cavity is avoided when the uterine incision is made. In other cases the uterus need not be brought out through the abdominal incision.

(2) Open the uterus in the centre of the presenting part by means of an incision six inches (15 cm.) in length, the edges of the abdominal wound being kept firmly pressed against the uterus by an assistant. If the placenta lies under the wound, it must be cut or torn through.

(3) The child is rapidly extracted by the head, if the latter can be easily reached, if not by both feet. The cord is clamped and divided.

(4) The uterus is lifted out of the abdomen, and an assistant grasps the lower uterine segment tightly, as far down as possible, in order to check hæmorrhage.

(5) The placenta, membranes, and blood-clots are removed from the uterus, and the cervix is ascertained to be patulous, otherwise it is dilated by passing a clamp gently through it and opening the clamp slightly.

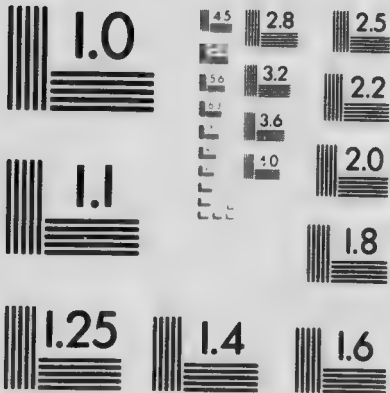
(6) The uterine incision is then stitched up by deep silk sutures. These traverse the entire thickness of the uterine wall, with the exception of the mucosa, and are passed at intervals of a centimetre ($\frac{2}{5}$ inch). Superficial sutures, including the peritoneum and a little of the muscular coat, may be inserted between the deep sutures if necessary.

(7) The peritoneal cavity is cleansed, and the uterus is replaced.



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(8) The abdominal wound is sutured.

After-treatment. — The after-treatment of the case resembles that of any abdominal section. The patient may be allowed to sit up in bed supported by a bed-rest almost from the first. The abdominal sutures are removed on the eighth day; and, if all goes well, the patient is allowed out of bed at the end of twelve days.

RADICAL CÆSAREAN SECTION.

The operation of radical Cæsarean section consists in the removal of the fœtus from the uterus in the manner just described, followed by the removal of the uterus either supra-vaginally or completely.

Indications.—Radical Cæsarean section is indicated instead of the conservative operation in the following cases:—

- (1) If the uterus is defectively developed.
- (2) If the uterus is the subject of some incurable disease, as cancer or myomata.
- (3) If the patient suffers from osteomalacia.
- (4) If we have reason to believe that the uterus has been infected with septic organisms during labour.
- (5) In certain cases of severe concealed accidental hæmorrhage (*v.* page 352).

Operations.—The preliminary steps of the radical operation down to and including the removal of the fœtus, are similar to those of the conservative operation. One of two forms of hysterectomy are then performed:—

- (A) Supra-vaginal hysterectomy.
- (B) Complete hysterectomy.

(A) **Supra-vaginal Hysterectomy.** — Supra-vaginal hysterectomy is the operation of choice in all cases except when malignant disease of the uterus is present.

It is performed in the same manner as in the case of a non-pregnant myomatous uterus.

(B) **Complete Hysterectomy.**—Complete hysterectomy is indicated whenever malignant disease of the cervix or body of the uterus co-exists with pregnancy; in the presence of myomata which cannot be removed by a partial hysterectomy; and whenever there is sloughing or decomposition inside the uterus. The operation is performed in a similar manner to that adopted in the case of a non-pregnant uterus.

EXTRA-PERITONEAL CÆSAREAN SECTION.

Extra-peritoneal Cæsarean section is the term applied to an operation for the delivery of the foetus through an opening in the lower uterine segment. The latter is reached through a transverse incision in the lower part of the abdominal wall (Pfannenstiel's incision), and before opening the uterus the site of the incision is made extra-peritoneal so far as possible by suturing the upper cut edge of the parietal peritoneum to the visceral peritoneum along the line at which it passes off the bladder on to the anterior uterine wall. In this manner the contents of the uterus are prevented from finding their way into the general peritoneal cavity, and so the risk of infection is lessened.

Indications.—Extra-peritoneal Cæsarean section may be sometimes indicated when the patient has been for a long time in labour, and when there is probably intra-uterine infection. In protracted labour the lower uterine segment is expanded, and becomes large enough to afford room for the necessary incision.

Operation.—The abdominal skin, fat, and rectal fascia are divided by a curved transverse incision slightly above and almost parallel with the upper margin of

the pubic bones and Poupart' ligament, and about eight inches in length. The bellies of the recti muscles are then pulled forcibly outwards after being separated from one another by blunt dissection, or with the fingers. The parietal peritoneum is then separated from the top of the bladder as much as possible, and is incised transversely just above the bladder, and the peritoneal cavity opened. The peritoneum on the face of the uterus immediately above the attachment of the bladder is then similarly divided, and the upper edge of this peritoneum is sutured to the cut edge of peritoneum on the abdominal wall. The peritoneum on the uterus is then separated downwards as far as possible so as to expose the entire lower uterine segment.

This segment is then cut through by a vertical median incision of sufficient length to allow the fœtus to be extracted through it. The fœtus is delivered either by the hand as in the classical operation, or by means of a special forceps applied to the head, and, after the removal of the placenta and membranes, the incisions are again closed in the usual manner. Some operators attach particular importance to bringing the peritoneum back into place, and then drawing the bladder up again also into place, so that there may not be adhesions formed between the uterus and the anterior abdominal wall.

PUBIOTOMY.

Pubiotomy, or hebotomy, is the term applied to the division of the pubic bone slightly to one or other side of the middle line, so as to allow an enlargement of the pelvic cavity similar to that caused by symphysiotomy. The advantages, which the operation possesses

over symphysiotomy, are that the divided bone unites more rapidly than does cartilage, and that there is not the same interference with the structures at the back of the symphysis, *i.e.* the urethra and the veins of the clitoris. Its advantages over Cæsarean section are that it can be performed later in labour, so that in certain cases of pelvic contraction the patient can be given a chance to deliver herself before resorting to operative measures, and also that it usually causes a permanent increase in size in the pelvis, so enabling future labours to end normally. Its disadvantage is that it sometimes is accompanied by serious vaginal laceration.

Indications.—Pubiotomy is indicated in contracted pelvis when the true conjugate measures more than $2\frac{3}{4}$ inches (7 cm.) in length, and when the head is not driven into the brim by the uterine contractions, and cannot be brought down by the forceps. By dividing the pubic bone an average separation of the pubic bones of about $2\frac{3}{8}$ inch (6.5 cm.) occurs, and this yields an increase in the true conjugate of three-fifths of an inch (1.5 cm.). Then, if the head comes through the pelvis in such a manner that one parietal eminence bulges into the gap, an additional gain of two-fifths of an inch (1 cm.) is obtained (*v.* Fig. 191). Assuming the bi-parietal diameter of the foetal head to be $3\frac{3}{4}$ inches (9.5 cm.), and the average increase in the true conjugate to be one inch ($\frac{3}{8} + \frac{2}{5}$), it is plain that the minimum true conjugate that permits of pubiotomy is $2\frac{3}{4}$ inches (7 cm.). As much as $3\frac{3}{8}$ inches (9 cm.) separation of the pubic bones has been obtained with safety, yielding an increase in the true conjugate of a little over four-fifths of an inch (2 cm.). Pubiotomy is also said to be indicated in face presentation when the chin rotates posteriorly and when efforts to correct the malposition have failed, and

in brow presentations which cannot be corrected or delivered by the forceps, and the child is alive.

Preparation for Operation.—When the patient comes into labour, the usual disinfection of the field of operation is carried out, and a Champetier's dilator (v. page 500) is placed in the vagina, with the double object of preventing premature rupture of the membranes by

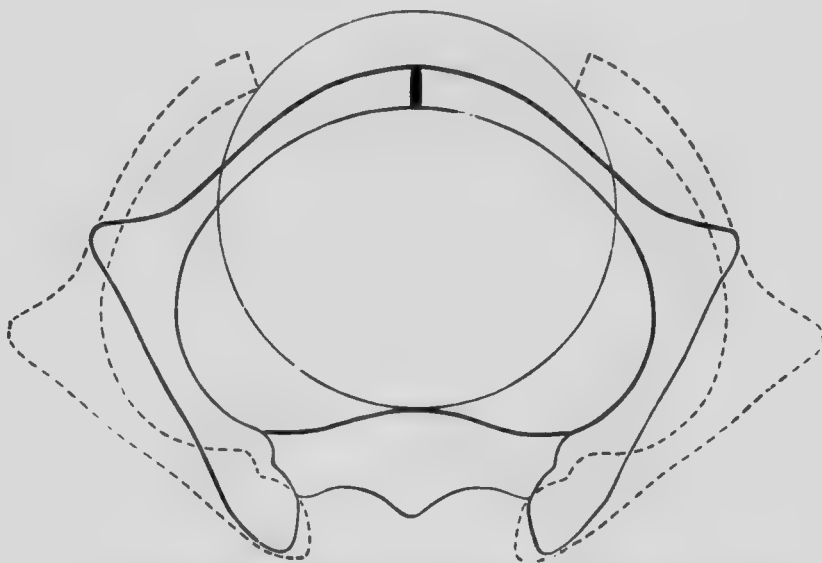


FIG. 191.—Diagram showing the increase in the diameters of the pelvis obtained by the division of the bones, and the manner in which the bi-parietal diameter of the head protrudes into the gap. (*Galabin.*)

supporting them, and of dilating the vagina. As soon as the uterine orifice is fully dilated, the colpeurynter is removed and the membranes are ruptured. If the uterine orifice does not dilate naturally owing to premature rupture of the membranes, it must be dilated with Champetier's bag.

Operation.—Four assistants are required, one to assist the operator, one to give the anæsthetic, and one to sit at each side of the pelvis and prevent sudden springing

apart of the bones. It is possible, however, to perform the operation with two, one to give the anæsthetic and one to assist the operator. The operation should be performed as soon as it is recognised that the head cannot pass through the contracted brim, and the os is sufficiently dilated. Two types of operation have been described. The older is the so-called open method of Döderlein, while the one usually performed now is the subcutaneous method of Bumm. The latter is the more usually adopted, and is simpler and safer. Its steps are as follows:—

- (1) The patient is placed in the dorsal gynæcological



FIG. 192.—Bumm's pubiotomy needle for introducing Gigli's saw.

position, and the legs are supported by rests or held by assistants. The field of operation is again disinfected and the bladder emptied.

- (2) The left labium is drawn over towards the opposite side as far as possible, with the subcutaneous vascular structures, and Bumm's sharp needle is pushed through the skin immediately below the point at which it is proposed to divide the pubic bone. The needle is then passed upwards behind the bone, under the guidance of the finger in the vagina, keeping the point as close to the bone as possible for fear of injuring the bladder. The point of the needle emerges through the skin above the bone vertically above the point of introduction.

- (3) A Gigli's saw (*v.* Fig. 192) is attached to the

point and drawn back behind the bone as the needle is withdrawn. The handles of the saw are then applied.

(4) The legs of the patient are then brought more closely together, and the assistants hold the sides of the pelvis so that they may separate gradually and gently when the bone is divided. The bone is then divided, the handles of the saw being so held that the latter forms the arc of a large circle. From six to ten movements of the saw usually effect division, but it is well

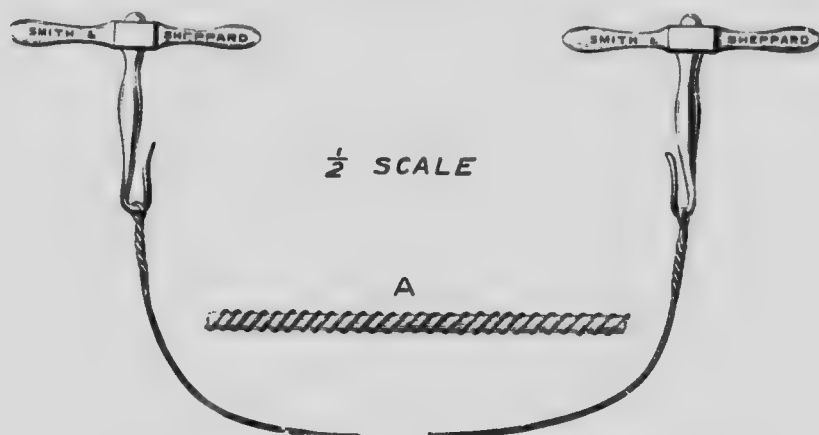


FIG. 193.—Gigli's wire saw, for pubiotomy. A. Enlarged view of the saw.

to be sure that division is complete before removing the saw. Some hæmorrhage often follows the removal, but it can usually be easily stopped by compression or by plugging after the delivery of the fœtus.

(5) The patient's legs are now allowed to hang down in Walcher's position (*v.* page 405), and, if possible, the head is pushed down through the brim. If not it is delivered with the forceps.

(6) As soon as delivery is complete, the uterus and vagina are tightly plugged with iodoform gauze, and firm compresses are applied over the labia and

pubes, so as to prevent the formation of a hæmatoma beneath the skin. A few strips of adhesive plaster or a special pelvic belt are applied firmly round the pelvis, and then a binder. The vaginal tampon may be removed in eight hours.

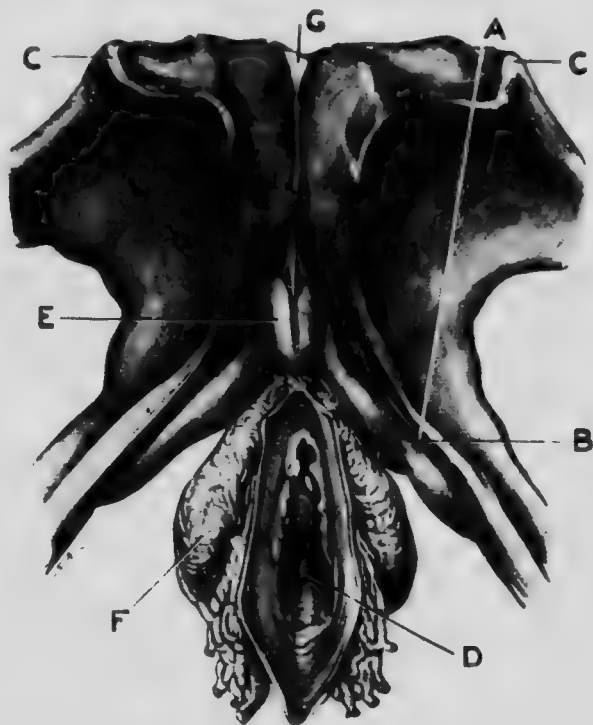


FIG. 194.—Front view of the symphysis and the pubic bones (Toldt), showing the line, A B, of division of the bone. G. Symphysis. C. Pubic spines. E. Clitoris. F. Vaginal bulbs. D. Orifice of vagina.

After-treatment.—The patient must lie upon her back for twelve days. As a rule she may get up on the fourteenth day, and she is able to walk a few days later.

Dangers.—Laceration of the vagina, communicating with the ends of the bone, is a serious complication, and

is most likely to occur when delivery is effected by the forceps or by version, especially in primiparæ whose vaginæ have not been previously dilated. Injury to the bladder may also occur, and should be repaired by suturing, as must also vaginal lacerations. Among thirty cases reported by Kannegiesser, there was no maternal or foetal mortality. Laceration of the vagina communicating with the wound occurred five times, the bladder was injured once, and there were three cases of thrombosis of the femoral vein.

CHAPTER XXXIV.

CRANIOTOMY AND EMBRYOTOMY.

Craniotomy: Perforation, Evacuation, Compression, Extraction—Perforation in Face Presentation, of the aftercoming head—Embryotomy: Decapitation, Evisceration—Cleidotomy.

CRANIOTOMY.

By the term craniotomy is meant any cutting operation performed upon the head of the fœtus, with the object of reducing its bulk.

Indications.—As craniotomy of necessity implies the death of the child, it is only permissible under conditions of absolute necessity if the child is alive. The indications for the operation are as follow :—

(1) If the child is dead, and if extraction of the undiminished head would be dangerous for the mother.

(2) If the child, in all probability, could not be extracted alive, and if such extraction would be dangerous for the mother.

(3) If the child is alive, and a relative indication for Cæsarean section or pubiotomy exists (*v.* pages 536, 541), but the mother refuses the operation.

Instruments.—The instruments which are required, and which are best adapted for craniotomy, are :—Simpson's perforator (*v.* Fig. 195) : a combined cranio-

clast and cephalotribe (a. Fig. 196) ; and a large-sized Bozemann's catheter.

Conditions.—Certain conditions must be fulfilled before the operation can be performed:—

(1) The pelvis must not measure less than two and a quarter inches in the true conjugate in the case of a flat pelvis, and than two and a half inches in the case of a generally contracted pelvis. Extraction of even a perforated head, through a smaller pelvis, is so dangerous that it should not be attempted.

(2) The uterine orifice must be sufficiently dilated to permit the necessary manipulations.

Method.—Place the patient—previously anæsthetised

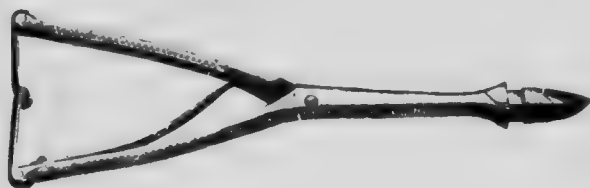


FIG. 195.—Simpson's perforator.

—in the cross-bed position. Palpate the abdomen carefully, and disinfect the vulva and vagina thoroughly in the usual manner.

The operation consists of four steps:—

- (1) Perforation.
- (2) Evacuation.
- (3) Compression.
- (4) Extraction.

(1) **Perforatio.**—Introduce as much of the hand as is necessary into the vagina, pass two fingers inside the os, and touch the presenting part. If the head is not fixed, get an assistant to hold it steady at the pelvic brim. Slip the locked perforator upwards, under guard of the fingers, and press it firmly and steadily through

the centre of the presenting part, be it bone or suture. If this is done, and if the pressure is made perpendicularly to the surface against which it is applied, there is less risk of the instrument slipping. Then release the catch which locks the perforator, and press the handles together: this separates the blades, so making



FIG. 196.—Winter's modification of Auvar's combined cranioclast and cephalotribe.

a longitudinal cut in the calvarium. Withdraw the instrument partially, turn it round through a right angle, and push it up. Again open the blades, so making another cut at right angles to the former one.

(2) **Evacuation.**—Push the perforator, through the opening thus made, down to the base of the skull, and, moving it about, break up the brain thoroughly. Begin with the medulla oblongata in order to ensure the death

of the child. Next, introduce the Bozemann's catheter, and douche out the fragments of the brain. If the latter has been completely broken up, it can quickly be washed away.

(3) **Compression.**—Now take the combined cranioclast and cephalotribe. It consists of three blades:—



FIG. 197.—First step in the application of the combined cranioclast and cephalotribe.

a central or male blade, and two outside blades, both of which lock into the central blade. One of these outer blades locks with the central blade so as to form a cranioclast, the other blade completes the cephalotribe. The instrument is also furnished with a strong screw, which can be adjusted so as to compress either external blade against the central blade. To use it, introduce the

central blade into the interior of the cranium, and then pass one of the external blades upwards, in such a manner that it lies over the face of the child (*v.* Fig. 197). Take care that the central blade is so turned that its convexity points towards the external blade, as otherwise it would not have a firm grip upon the head. We



FIG. 198.—Second step in the application of the combined cranioclast and cephalotribe.

have now a cranioclast upon the child's head, and, if the obstruction is not too great, the head can be delivered by it without using the other blade. A cranioclast acts by elongating the evacuated head, and so reducing all its transverse diameters.

In some cases it may be necessary to reduce the size

of the head still further, and this can be accomplished by the aid of the third blade.

Having applied the cranioclast over the face of the child, and tightened the screw until the catch can be fastened, introduce the third blade, so that it lies at the opposite side of the head to the cranioclast (*v.* Fig.



FIG. 199.—Final step in the application of the combined cranioclast and cephalotribe.

198). Lock it, and apply the screw to it. Then tighten the screw until the handles come sufficiently close to enable the catch which holds the third blade to be fastened (*v.* Fig. 199). Always endeavour to grip the base of the skull with the tips of the outer blades.

The great advantage which Auvard's instrument possesses is, that the head can be crushed without any

fear of the cephalon slipping, as it is held firm by the previously applied cranioclast.

(4) **Extraction.**—Perforation should always be followed immediately by extraction. In many cases the contractions of the uterus would, after a little time, expel the perforated head without assistance, but it is not wise to allow this to occur. In the first place, decomposition proceeds very rapidly inside a perforated head, and the patient may thus become infected. In the next place, she has probably been allowed to remain undelivered as long as is safe, and therefore the uterus must now be emptied. Extraction is performed by means of the cranioclast or the combined instrument. In performing it the head should be rotated so as to imitate, as nearly as possible, the normal mechanism of labour.

In the case of a *face presentation*, endeavour to introduce the perforator through one of the orbits, and, failing that, through the roof of the mouth.

In the case of the *after-coming head*, the operation of perforation is sometimes difficult. The perforator may be introduced either into one of the lateral fontanelles, or into the occipital bone (Dührssen). If the former site is chosen, draw the body of the child forwards, and to one side, so that the lateral fontanelle descends. If the latter site is chosen, draw the body forcibly backwards, introduce the fingers of the left hand between the symphysis and the occiput of the child, and perforate at the highest point which is protected by the fingers.

EMBRYOTOMY.

Embryotomy is the term applied to any operation intended to reduce the size or shape of the child's

body. It includes decapitation, evisceration, and cleidotomy.

Decapitation.—By decapitation is meant the separation of the child's head from the body at the neck.

Indications.—It is indicated in cases of neglected shoulder presentation, when version is either impossible or is contra-indicated, and in which the neck can be reached; also in cases of locked twins, when the after-coming head of the first has become interlocked with the fore-coming head of the second.



FIG. 200.—Braun's blunt hook for decapitation.

Instrument.—In neglected shoulder presentation the best instrument for performing decapitation is Braun's blunt hook (*v.* Fig. 200). It performs the operation with ease, and with a minimum of danger for the mother. Ramsbotham's sharp hook is also recommended for this purpose.

Method.—Place the patient, fully anæsthetised, in the cross-bed position. Introduce one hand into the vagina, and endeavour to encircle the neck from behind with the fingers. Next, pass the hook, under cover of the hand, upwards along the back of the child's neck; turn it, so that it lies over the neck of the child; and, finally, by a series of twisting movements, fracture the spinal column. Then, tear through or twist away the

soft structures of the neck with the blunt hook, or divide them with a pair of stout blunt-pointed scissors. Finally, draw down the arms, and extract the trunk by traction upon them.

The head is extracted last and may cause some trouble. The easiest method of extracting it is to pass the hand into the uterus, and two fingers into the mouth, and in this way to draw the head downwards, whilst an assistant at the same time makes pressure on the fundus. It may be necessary to perforate and crush the head, if the pelvis is contracted.

Evisceration.—Evisceration consists in making an opening into the thorax or abdomen of the child, and through it removing some of the viscera.

Indications.—It is indicated if the size of the child's body obstructs delivery, or in the case of a neglected shoulder presentation, if decapitation is indicated but the neck cannot be reached.

Instrument.—Simpson's perforator, with which to make the necessary opening in the trunk, is all that is required. A pair of sharp-pointed scissors will answer equally well.

Method.—The patient must lie in the cross-bed position as before. Introduce the perforator into whatever portion of the trunk can be most easily reached. Make an opening sufficiently large to allow the hand or the fingers, according as is necessary, to be introduced. Seize any of the larger viscera that present, and tear them away. In this manner the liver, lungs and heart may be removed. When the size of the trunk is sufficiently reduced, fracture the spinal column, either by cutting it or by twisting it with Braun's blunt hook, and then extract the child by pulling down first the pelvis and lower limbs, then the trunk and arms, and

lastly the head. If there are no instruments at hand for fracturing the spine, pass the hand into the uterus, seize the feet, and extract the child as a pelvic presentation.

Cleidotomy.—The operation of cleidotomy or division of the clavicles is useful when the size of the shoulders prevents delivery. From experiments upon dead children it has been found that division of one clavicle reduces the bis-acromial circumference by from one to three centimetres, and that division of both clavicles

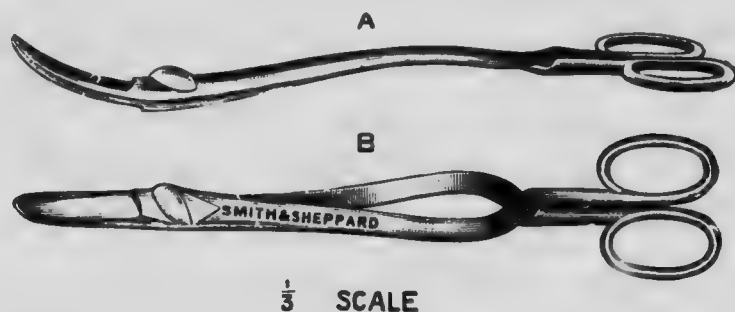


FIG. 201.—Long-handled scissors with double curve.

reduces it by from three to four centimetres. In none of these experiments was the subclavian artery divided, or the subclavian muscle injured, so that it is possible that the operation may be justifiable in the case of a living child (Bonnaire).

Indications.—Cleidotomy may be indicated in impaction of the shoulders, when it is impossible to deliver the foetus by traction even after the arms have been brought down.

Instrument.—The only instrument required is a long and stout pair of scissors with blunt points (v. Fig. 201).

Operation.—The fingers of the left hand are passed

into the vagina and the position of the clavicle is ascertained. The scissors are then passed upwards under cover of these fingers, and the clavicle is divided at or near its centre, taking care to include only the bone and the covering skin. The clavicle on the opposite side is similarly divided, if necessary. The fœtus can then be usually delivered by traction on the arms and pressure on the fundus. If delivery is still impossible, further reduction of the shoulder girdle can be effected by dividing the skin over, and the posterior muscular attachments of, the scapulæ, as this enables the latter to move round anteriorly, so lessening the bis-acromial diameter.

CHAPTER XXXV.

THE INFANT—INFANT FEEDING.

Changes in the Infant after Birth—The Umbilical Cord—Temperature—Respiration—Pulse—Bowels—Urine—Weight—Breast Feeding—Artificial Feeding—Punctuality—Cleanliness—Suitable Food—Composition of Cow's and of Human Milk—Sterilisation of Milk, Pasteurisation—Farinaceous Foods.

CHANGES IN THE INFANT AFTER BIRTH.

The Umbilical Cord.—The changes which take place in the circulation of the infant at, and subsequent to, birth have been already described (v. page 38). The stump of the umbilical cord does not materially change during the first twenty-four hours. Subsequent to this a line of demarcation begins to show itself, and the cord becomes progressively drier, brown and mummified. It usually falls off between the third and sixth day. The umbilical arteries then gradually shorten, and the remainder of the cord is drawn like a plug into the umbilicus, which it completely fills, and so prevents the occurrence of an umbilical hernia (Winckel). The only essentials in managing the cord are to keep it dry and aseptic, and it should never be let get wet when the child is washed. It is usually dressed after birth, and after each bath, as follows:—The cord is well dried, and then dusted with a powder consisting of equal parts of boracic acid and starch. Then, a piece

of perfectly clean and soft linen about five inches square is taken, and cut to the centre on one side. The linen is drawn round and beneath the cord from above downwards, so that the insertion of the cord lies at its centre. The cord is then drawn gently upwards, and allowed to lie on the piece of linen which is above the umbilicus. Lastly, each side of the linen is folded so as to envelop the cord. The infant's binder is then applied in the usual manner.

Temperature.—The usual temperature of the infant at birth is about 99.8° F. (37.6° C.). It falls a little after the first bath, and from that time on it is much the same as in the adult, and varies from 98.8° to 99° F. (37.1° C. to 37.2° C.). A temperature of more than 100° F. (37.7° C.), after the fourth day is usually an indication of the presence of some pathological condition, and, as will be subsequently mentioned, one of the symptoms of insufficient food, during the first few weeks, is a rise in the temperature. The temperature of an infant must be taken in the rectum.

Respiration.—When the infant is awake its respirations are usually irregular, and vary in rate between 30 and 60 per minute. During sleep, they are comparatively regular, and are slightly more frequent than when the infant is awake.

Pulse.—An infant's pulse is generally somewhat irregular, and is increased in rate by any excitement, such as crying, or while it is sucking. Its rate can be best determined while the infant is asleep. It may be counted by feeling at the wrist or over the heart, or by watching the pulsations of the large fontanelle. The average pulse-rate during the first two months is 137 per minute, from the third to the sixth month 128 per minute, and from the seventh to the twelfth 120 per minute.

Bowels.—The motions of the infant during the first couple of days consist of the so-called meconium, a name derived from its resemblance to thick poppy juice (*μῆκων*, a poppy). The meconium is composed of mucus from the small intestine, mixed with bile and desquamated epithelial cells. In from one to three days, the stools assume the usual yellow colour of an infant's motions. The usual number of stools is from two to three or four in the twenty-four hours; they are fluid in consistency, and slightly faecal in odour.

Urine.—The urine of the new-born infant is slightly acid, of a pale yellow colour, and of a specific gravity of 1005 to 1007. It is passed from six to fifteen or twenty times daily. During the first two or three days after birth the daily quantity passed is from three to twelve drachms (10·5–42 c.cs.). It then gradually increases, until by the sixteenth or seventeenth day it is from fifty-seven to eighty-five drachms (202·5–302 c.cs.).

Weight.—The average weight of an infant at birth is about seven pounds (3175 grms.). During the first two or three days, there is a loss in weight amounting to about half a pound (227 grms.). As soon as the cord has separated and begun to cicatrise, the infant begins to regain its weight, and by the seventh or eighth day it is as heavy as at birth. From this time onwards, it should gain steadily in weight, and any failure to do so shows that everything is not going on as it ought. In bottle-fed infants, it is particularly necessary to weigh the infant every week, in order to ascertain if it is receiving and assimilating its proper proportion of nourishment. The following table shows the average daily and monthly increase in weight of an infant, beginning with an initial weight of 7 lbs. 11 oz. (3487 grms.) (Fleischmann):—

| Month. | Daily increase. | | Monthly increase. | | Weight. | | |
|--------|-----------------|-------|-------------------|-------|---------|-----|-------|
| | oz. | drms. | oz. | drms. | lb. | oz. | drms. |
| 1st | 1 | 3·7 | 37 | 0 | 9 | 14 | 0 |
| 2nd | 1 | 2·0 | 33 | 14 | 11 | 15 | 14 |
| 3rd | 0 | 15·8 | 29 | 10 | 13 | 13 | 8 |
| 4th | 0 | 12·4 | 23 | 4 | 15 | 4 | 12 |
| 5th | 0 | 10·1 | 19 | 1 | 16 | 7 | 13 |
| 6th | 0 | 7·9 | 14 | 13 | 17 | 6 | 10 |
| 7th | 0 | 6·7 | 12 | 11 | 18 | 3 | 5 |
| 8th | 0 | 5·6 | 10 | 9 | 18 | 13 | 14 |
| 9th | 0 | 5·6 | 10 | 9 | 19 | 8 | 7 |
| 10th | 0 | 5·0 | 9 | 8 | 20 | 1 | 15 |
| 11th | 0 | 4·5 | 8 | 7 | 20 | 10 | 6 |
| 12th | 0 | 3·3 | 6 | 5 | 21 | 0 | 11 |

INFANT FEEDING.

The mother should always suckle her infant herself, unless there is some absolute reason to the contrary. In some cases, either for her own sake, or for the sake of the infant, it may be inadvisable for her to do so. She should not nurse her infant, for her own sake, if she is in a debilitated condition owing to previous hæmorrhages, phthisis, or any other wasting disease. She should not nurse the infant, for its sake, if she is suffering from any disease which she may communicate to it, as recently acquired syphilis, or phthisis; also if her milk does not agree with the infant, or if her breasts are inflamed. Depressed nipples prevent the infant from sucking. This difficulty may be overcome by improving the nipples in shape, by drawing the nipples out two or three times a day with clean fingers, so as to elongate them and improve their shape. If the shape cannot be improved, a nipple shield may be used, or a *tetarelle* (v. Fig. 202). The latter is an apparatus by the aid of which the mother draws off the milk into

a receptacle, from which the infant can then suck it. If the mother can be induced to use it intelligently, and if it is kept clean, it is an excellent instrument. But usually these are insuperable difficulties.

If a mother cannot suckle her infant, a wet-nurse is the best substitute. However, it is so extremely difficult to obtain a suitable nurse, that bottle feeding is usually necessary. The following are the essentials for a wet-nurse:—

- (1) She must be perfectly healthy, and free from any disease which can be communicated to the infant.
- (2) She must be between twenty and thirty-five years of age.

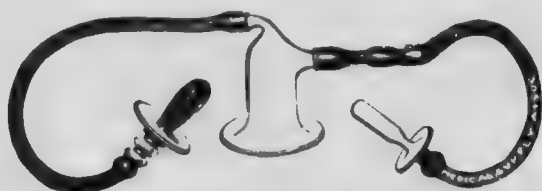


FIG. 202.—A tetarelle.

(3) Her breasts must be firm, with well-shaped nipples and contain abundance of milk.

(4) Her own infant must be about the same age as, or slightly older than, the infant she is going to nurse, and must be thriving well upon her milk. Also, she must be prepared to give up nursing it.

(5) Her character must be sufficiently good to allow of her being brought into the patient's house.

Artificial feeding has frequently to be adopted. If it is properly carried out the infant will thrive well, but there are many difficulties in the due performing of it.

There are three essentials in feeding an infant:—punctuality, cleanliness, and suitable food.

Punctuality.—The infant must be fed at stated

times. It must not be fed between these times, and if it is asleep at the hour for its food it must be awakened. The infant should be put to the mother's breast from three to four hours after birth, unless the condition of the mother forbids it. The objects of doing so are to cause increased contraction of the uterus, to allow the infant to obtain the benefit of the colostrum, and to assist in drawing out the nipples. If it is not done, the breasts become distended, and the difficulty which the infant naturally finds in obtaining a grip of the nipple is increased. For the first month, the infant is fed every two hours during the day, leaving one interval of four hours at night. From the beginning of the second month, the interval between the meals is gradually increased; until, at the end of the second month, the infant is being fed every two and a half hours, and at the end of the third month every three hours.

Cleanliness.—If the infant is breast-fed, the nipples must be washed with warm water before it is put to them. If the infant is bottle-fed, the bottle must be kept absolutely clean. A good bottle should be of the familiar boat shape, *i. e.* it should have no angles. The nipple should fit directly on to the mouth of the bottle, without the intervention of a tube. An excellent bottle is now made with an opening at either end, by means of which it can be thoroughly cleaned out. Immediately after feeding the infant, the bottle should be rinsed out with cold water, to which a little common rock salt has been added; then scalded with boiling water; and kept, when not in use, in a solution of soda and water. It must be thoroughly rinsed out in cold water before the milk is put into it. The rubber teat should have a little salt put into it, and then be well rubbed between the fingers and thumb and finally

washed out with plain water. It should also be boiled for a few minutes at least once in the twenty-four hours. When the infant is being fed, it should be taken by the nurse on her knee, and held there with one hand while the bottle is held with the other. As soon as the infant has taken what it wants, the remainder of the milk should be poured away.

Suitable Food.—If the infant cannot be fed on human milk, then the best substitute is cow's milk in some form.

The average composition of human milk and of cow's milk is shown in the following table, and side by side with it is placed, for purpose of comparison, the average composition of colostrum:—

| | Colostrum. ^a | Human Milk. ^b | Cow's Milk. ^c |
|---|-------------------------|--------------------------|--------------------------|
| Proteins (caseinogen and lactalbumin) . . . | 5'71 | 1'50 | 4'00 |
| Fat | 2'04 | 4'00 | 3'50 |
| Sugar (lactose) . . . | 3'74 | 7'00 | 4'30 |
| Salts | 0'28 | 0'20 | 0'70 |
| Water | 88'23 | 87'30 | 87'50 |
| | 100'00 | 100'00 | 100'00 |
| Sp. gr. | 1040—1046. | 1010—1040. | 1028—1033. |
| Reaction | { Strongly alkaline. | Slightly alkaline. | Usually acid. |

^a Pfeiffer.

^b Pfeiffer, Koenig, Leeds, and Harrington.

^c Holt.

By reference to this table we find that cow's milk differs from human milk in containing more proteins, slightly less fat, and considerably less sugar. Not only does the quantity of proteins differ in the two milks, but also their quality. Cow's milk contains a larger quantity of albumin which is coagulable by an acid; consequently, when the gastric juice acts upon it, it tends to form a large firm curd. Human milk under the same conditions curdies in a flocculent mass. and

so is more easily digested. The amount of proteid substances coagulable by an acid in cow's milk is about four times as great as the non-coagulable portion; while in woman's milk the non-coagulable portion is twice as great as the coagulable portion (Leeds). This is owing to the fact that in cow's milk there is more caseinogen than lactalbumin, while in woman's milk there is less. Further, cow's milk, as it is supplied to the consumer, is faintly acid and contains bacteria,

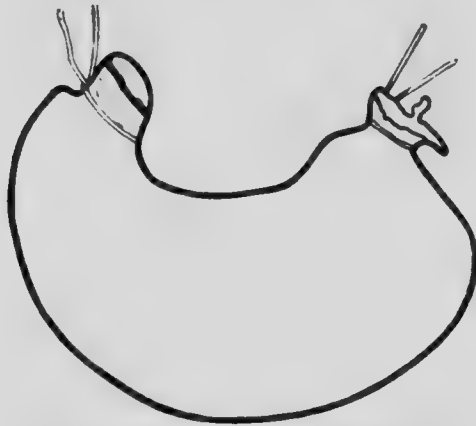


FIG. 203.—Outline of stomach of newly-born infant, actual size.
(Holt.)

whereas human milk is alkaline and contains no bacteria.

We thus see that cow's milk must be considerably modified before it can be made a reliable substitute for human milk. First of all, the proportion of caseinogen must be diminished. This is done by adding a certain quantity of water, which of course still further diminishes the proportion of sugar and fat. These must now be increased by adding sugar and fat in some form. Milk-sugar, or lactose, is generally considered to be the best form of sugar to use, but in some cases it

may be well to substitute Demerara sugar, as this counteracts any tendency to constipation on the part of the child. The amount of fat is increased by the addition of cream. If cream cannot be obtained, cod-liver oil may be administered separately. The proportion of fat in the milk of different herds of cows varies more than does the proportion of any other constituent of the milk. Moreover, the removal of some of the cream from milk, before it is sold, is not an uncommon practice. Hence it is well—particularly if the child is not thriving—to ascertain the proportion of fat which the milk contains. A large deficiency in the amount of fat can be determined by taking the specific gravity. If the amount of fat is materially diminished, the specific gravity is raised. To ascertain the existence of slight degrees of excess or diminution in the amount of fat, a laboratory examination is necessary. Lastly, we must endeavour to cause the cow's milk to curdle in a flocculent mass, otherwise this method of feeding will fail. Barley-water, added to the milk instead of plain water, accomplishes this end.

In judging of the total quantity which is to be given at a meal, and of the respective proportions of milk and barley-water, we must be guided by the capacity of the infant's stomach, and by the analysis of normal breast milk at the different periods of lactation. The average capacity of an infant's stomach at birth is an ounce (28·4 c.cs.) (*v.* Fig. 203), at three months four and a half ounces (127·8 c.cs.), at six months six ounces (170·4 c.cs.), and at twelve months nine ounces (255·6 c.cs.) (Holt). The following table, based on Holt's excellent tables, shows the proportions of fat, sugar, and proteids which must be present in modified cow's milk, and the quantity of food required by an infant at different periods during the first year. As will be seen later, these

Table showing the proportions of fat, sugar, and proteins which should be present in modified cow's milk, and the quantity of food required by an infant at different periods.

| Age | Fat. | Sugar. | Proteins. | No. of feedings in the twenty-four hours. | Interval between meals by day. | No. of night feedings (10 p.m. to 7 a.m.). | Quantity at one feeding. | | Quantity in twenty-four hours. |
|------------------|-----------|-----------|-----------|---|--------------------------------|--|--------------------------|---------|--------------------------------|
| | Per cent. | Per cent. | Per cent. | | | | Ounces. | Ounces. | |
| 1st day . | . | . | . | 4 | 6 | 1 | 1* | 4 | |
| 2nd day . | . | . | . | 6 | 4 | 1 | 1-1.5 | 6-9 | |
| 3rd-7th day . | 2.0 | 6.0 | 0.60 | 10 | 2 | 2 | 1.5-2 | 15-20 | |
| 2 to 4 weeks . | 2.5 | 6.0 | 0.80 | 10 | 2 | 2 | 2-2.5 | 20-25 | |
| 1 to 3 months . | 3.0 | 6.0 | 1.00 | 8 | 2½ | 1 | 3-4.5 | 24-36 | |
| 3 to 5 months . | 3.5 | 6.0 | 1.25 | 7 | 3 | 1 | 4-5.5 | 28-38 | |
| 5 to 9 months . | 4.0 | 7.0 | 2.00 | 6 | 3 | 0 | 5.5-7 | 33-42 | |
| 9 to 12 months . | 4.0 | 6.0 | 2.50 | 5 | 3½ | 0 | 7.5-9 | 38-45 | |

* One ounce is equal to 28.4 c.c.s.

proportions involve giving a weaker mixture than is usually considered advisable. They may therefore be considered as the minimum amount required by a healthy baby.

The next table shows a simple method of obtaining the required proportions of the different constituents as shown by the preceding table. As a rule, however, in the case of a healthy baby the quantity of "plain milk" given may be doubled.

| Age of infant. | Gravity cream (16 per cent.). | Plain milk. | Milk-sugar. | Barley-water. |
|----------------|----------------------------------|-------------|-------------|---------------|
| | Drachms. | Drachms. | Teaspoons. | Drachms. |
| 3rd—14th day. | 2½ | 1½ | 1½ | 20 |
| 2—4 weeks. | 3 | 2 | 1½ | 19 |
| 1—3 months. | 4 | 2 | 1½ | 18 |
| 3—5 months. | 4 | 5 | 1½ | 15 |
| 5—9 months. | 4 | 8 | 1½ | 12 |
| 9—12 months. | 3½ | 12 | 1½ | 9½ |

The correct amount of the mixture to give at each feeding will be found in the preceding table.

Even after the relative proportion of the ingredients of cow's milk has been altered so as to make it resemble human milk, a most important point of difference between the two still remains, *i. e.* that there are always swarms of micro-organisms in cow's milk as the consumer gets it. These must be got rid of in some manner. The most obvious method is to boil the milk. There are, however, great objections to this, as it renders the milk less nutritious, and more difficult to digest, and causes constipation. On the other hand, it is generally believed that the nutritive properties of milk are only very slightly affected by the application of any heat short of the boiling-point of milk. On this hypothesis is founded the method of sterilising milk recom-

mended by Budin, of Paris. This method consists in placing the required amount of milk in a bottle which is three-quarters immersed in water. The latter is raised to boiling-point, at which it is kept for forty minutes. The bottle of milk is then removed and rapidly cooled. This continued heat is sufficient to effect the necessary sterilisation. The most convenient form of apparatus for carrying out this process is that devised by Soxhlet, and is shown in Fig. 204. By its means, a number of bottles, each containing sufficient for one feeding, can be prepared at one time, and are

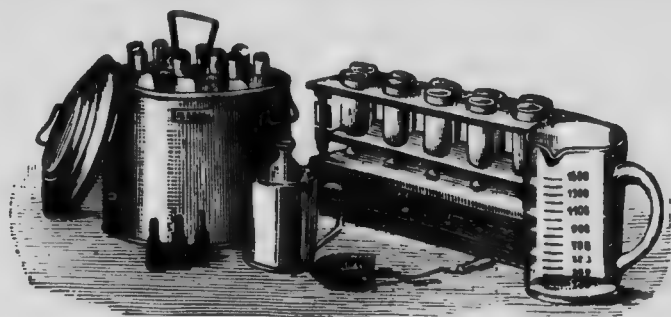


FIG. 204.—Soxhlet's milk steriliser.

kept from subsequent contamination by means of a small rubber cap, which is sucked into the mouth of the bottle as the contents cool.

Budin stated, further, that milk thus sterilised does not require to be diluted; in fact, that infants thrive considerably better on undiluted than on diluted milk. Our own experience is that infants thrive admirably on a suitable mixture of barley-water and milk prepared as has been described above, and then sterilised for thirty or forty minutes in boiling water. We have not found them do so well on undiluted sterilised milk.

Another method of destroying micro-organisms is by

"*Pasteurising*" the milk. This consists in raising it to a temperature between 158° F. and 176° F. (70°-80° C.), and keeping it at this temperature for thirty to forty minutes. This method destroys the greater number of bacteria and spores, but not all.

In many cases alterations must be made in the standard dietary, which has been given above, in order to suit the special requirements of the infant, and to ascertain the nature of these alterations the effect of the food that is taken must be carefully watched. If the child possets up unchanged milk, it is getting too much fluid. If it passes undigested curds, the milk is too strong. If it digests its food well, but seems always to be hungry, it may get more fluid with proportionately less barley-water, or, if that disagrees, a larger quantity of the usual mixture.

Too little sugar causes a slower gain in weight than is normal; too much sugar causes colic, and also perhaps thin green stools (Holt). Too little fat causes hard dry stools; too much fat causes vomiting or regurgitation of food and frequent motions, which sometimes contain whitish lumps composed of fat (Holt). Too much proteid matter causes curds in the stools, colic, sometimes diarrhoea, but more usually constipation. The following symptoms show that the child is not receiving sufficient nourishment:—

(1) During the first three days the temperature shows an inclination to rise; it ranges about 101°-102° F. (38·3°-38·8° C.), and may even reach 104° F. (40° C.) or more. This is the so-called inanition fever (Holt).

(2) The infant ceases to gain in weight.

(3) The infant draws the breast for a long time before it is satisfied. If the breast milk is abundant, five to ten minutes ought to be sufficient to satisfy it; if the milk is deficient it may require half an hour or more.

(4) Its sleep is irregular and disturbed, and when awakened it frequently cries.

(5) The stools are irregular and of an unhealthy appearance.

Farinaceous foods containing starch should never be given to young infants, as the secretions by which starch is digested, *i. e.* the saliva and the pancreatic juice, are not fully established until the child is six months old. Condensed milk, and prepared foods in which the starch has been changed into sugar, are sometimes of considerable use during the first two or three months of the child's life, especially if there is a difficulty in obtaining the due sterilisation of the milk. The objection to continuing their use for a longer period, as the sole food, is that they almost all contain too much carbohydrate, and too little nitrogenous matter. As a result, infants so fed become large and fat, but have not sufficient development of bone and muscle.

CHAPTER XXXVI.

INFANTILE DISEASES.

Asphyxia Neonatorum : Schultze's Method of Artificial Respiration—Cephalhæmatoma—Convulsions—Green Diarrhœa—Icterus Neonatorum—Late Hæmorrhage from the Cord—Mastitis—Ophthalmia Neonatorum—Retention of Urine—Strophulus—Thrush.

ASPHYXIA NEONATORUM.

INFANTS are frequently born asphyxiated after protracted labour, or when a malpresentation occurs, especially if it is a breech.

Degrees.—There are two degrees of asphyxia :—

(1) *Asphyxia pallida*, or white asphyxia.

(2) *Asphyxia livida*, or blue asphyxia.

The worse form of asphyxia is *asphyxia pallida*. In it, the infant is white when born, the cord is not pulsating, the heart can scarcely be felt, there are no attempts at respiration, and all reflexes are lost. In *asphyxia livida*, the infant is blue, the cord pulsates, the heart beats strongly, there are slight attempts at respiration, and the reflexes are present. In order to feel an infant's heart, press the fingers up under the arch of the ribs, a little to the left of the sternum. It is then easily felt if it is beating.

Treatment.—To treat an asphyxiated infant successfully a regular line of action must be laid down and carried out in due order, paying the greatest attention to details. If the infant is born in white asphyxia,—

- (1) Tie and divide the cord.
- (2) Place the infant in a bath of water at 100° F. (37.7° C.)
- (3) While it is in the bath, suck the mucus out of the trachea with a silver or gum-elastic catheter.



FIG. 205.—Schultze's method of performing artificial respiration.
End of the inspiratory movement.

(4) Take the infant out of the bath and dry it thoroughly.

(5) Perform Schultz's method of artificial respiration (see below) five or six times.

Repeat steps (2) to (5) over and over again until either the infant dies, *i.e.* its heart stops, or until it passes into the stage of asphyxia livida. As soon as this occurs we may assume that its reflexes have returned,

and may try to stimulate them. To do this, after taking the infant out of the hot bath, plunge it for a moment into a cold bath; then "Schultze" as before. Continue this routine, —hot bath, aspiration of mucus, cold bath, dry, "Schultze," until the infant begins to make strong efforts at respiration. Then, if there is a fire in the room, make the nurse sit down in front of it, and roll the infant on her knees. To do this, she places the infant across her knees on its side, and then rolls it half over on to its face, at the same time compressing the ribs. This causes expiration. She then rolls it in the opposite direction on to its back, at the same time removing all pressure from the chest, and pulling upon the arm which is uppermost, in such a way as to draw the ribs upwards. This causes inspiration. It is also a good thing to rub a few drops of whiskey on the gums and chest of the infant. An infant in white asphyxia must not be placed in a cold bath, as it depresses the heart dangerously.

Schultze's method of artificial respiration is performed as follows*:—Seize the infant in both hands, its back towards you, the thumbs hooked beneath the heads of the humeri, the index fingers along the sides of the thorax, the other three fingers along the back (*v.* Fig. 205). Then raise the infant with a quick sweep through the air until its body rolls forward upon your thumbs, which are now placed on the anterior aspect of the chest (*v.* Fig. 206); and, at the same time, compress the chest laterally with the index fingers and posteriorly with the other fingers, so diminishing its lateral and antero-posterior diameters. Owing to the position

* This description differs slightly from the original description of Schultze. He recommended to hook the index fingers, and not the thumbs, under the axillæ of the infant, thus avoiding the necessity of changing the grip.

of the infant, the abdominal viscera fall towards the diaphragm, forcing it upwards, and in this way diminish the vertical diameter of the chest. This movement causes expiration, and the inverted position favours the flow of mucus out of the trachea. Having kept the infant for a couple of seconds in this position, it is then swung forwards again into a vertical position. As the infant falls forward all compression is removed from the chest,



FIG. 206.—Schultze's method of performing artificial respiration.
Expiration.

and the infant is held by the shoulders, so that, as it falls, its weight causes the ribs to be drawn upwards (v. Fig. 205). This movement causes inspiration. The rate of inspiration ought to be from eight to twelve in the minute. It is important to note any attempt at inspiration, and to time our movements so as to synchronise with the attempt.

If the infant is born in a state of asphyxia livida, the cord must not be tied until it has ceased pulsating. As soon as this occurs, it is tied, and the infant treated as described.

CEPHALHÆMATOMA.

Cephalhæmatoma is the term applied to an extravasation of blood, which sometimes forms after labour under the periosteum subjacent to the caput succedaneum. It is due to the rupture of a vessel during delivery. At first, it consists of a more or less tense and slightly fluctuating tumour, and it is limited in extent by the sutures which surround the bone over which it forms. As the blood coagulates, the periphery of the swelling becomes as hard as bone, while in the centre there is a depression, and, consequently, at this stage, it feels as if there was an opening through one of the bones into the skull. A cephalhæmatoma does not require special treatment unless it suppurates, and then it must be opened and drained.

CONVULSIONS.

Convulsive attacks of a greater or less degree of intensity and frequency are by no means uncommon in early infant life.

Ætiology.—Convulsions must be regarded as the symptoms of the presence of a definite pathological condition, and not as a disease in themselves. Their relative frequency in infancy is due to the instability of the nerve-centres in the cortex of the brain at this period of life, an instability which renders them more prone to excessive response to slight stimuli than is the case at later periods of life. Three sets of pathological conditions are the most frequent causes of convulsions (Holt):—

- (1) Direct irritation of the cortex of the brain.
- (2) Reflex irritation of the cortex of the brain.

(3) Toxic influences affecting the cortex of the brain.

In the first of these classes are included the various forms of cerebral disease—meningitis, tumours, embolus, and the like. In the second class, are included severe injuries, prolonged retention of urine, the presence of undigested food in the intestinal tract, sudden application of extreme cold to the body, dentition, etc. In the third class, are included the various causes of auto-intoxication, as intestinal decomposition of food—perhaps the commonest cause of convulsions in young infants, suppression of urine, and asphyxial conditions. It will be seen that such an ætiology of convulsions as we have given closely resembles the suggested ætiology of eclampsia (*v.* page 305). And, practically, perhaps, convulsions in the infant may be regarded as the equivalent of eclampsia in the pregnant woman.

Symptoms.—The occurrence of a convulsion in an infant is denoted by twitching of the muscles of the face and eyes, rigidity of the body, clenching of the fists, and slight trothing of the mouth, and is associated with feeble and shallow respiration, feeble action of the heart, and a resulting pallid or cyanotic appearance of the infant. The attack may be single, or repeated attacks may rapidly follow one another. Death may occur as the result of a single attack, in which case it is probably due to cerebral or meningeal hæmorrhage, or to asphyxia. More commonly, however, death is caused by inanition due to the force and frequency of the attacks.

Treatment.—The infant should be immediately placed in a hot bath (100° F., 37·7° C.) for about five minutes, and cold at the same time applied to the head with the object of lessening the cerebral congestion. This is most easily done by applying to the head a sponge or handkerchief wrung out of cold water. After about five

minutes, the child is removed from the bath, quickly dried with a warm towel, and wrapped in a soft woollen garment. It should then be disturbed as little as possible. The cause of the convulsion must also be removed, as far as possible. If the convulsions are not checked by the bath, sedatives should be administered. Bromide of potash (grs. 2—3) and chloral hydrate (grs. 2—3) are most usually chosen, and are repeated every couple of hours until the convulsions cease. They may be given in enemata if necessary, and indeed, if the infant is unconscious they must be given in this manner. As has been mentioned, in the majority of cases the convulsion will be found to be the result of intestinal intoxication, *i. e.* poisoning by the absorption of toxins from the intestinal canal. Accordingly, the treatment proper for this condition must also be adopted—purgatives and intestinal antiseptics. Stimulants are also administered if the action of the heart is enfeebled, and, when cyanosis is marked and prolonged, the inhalation of oxygen has been followed by good results.

GREEN DIARRHŒA.

Diarrhœa, in the infant, consists in the passage of more than six stools in the twenty-four hours. The normal motions of an infant are yellow in colour, liquid in consistency, and slightly fœcal in odour.

Ætiology.—Green diarrhœa is due to the entrance of bacteria into the infant's stomach. They gain access in the food, most usually in sour milk. The green colour of the stools is due to the presence of biliverdin (Wegscheider), owing to the imperfect oxidation of the bile, or, according to some writers, to the formation of a green pigment by certain bacteria.

Symptoms.—The diagnostic symptom is the passage of green motions, and masses of foul-smelling, semi-digested curds. "Scalding" of the buttocks and skin round the anus almost invariably results, owing to the irritating character of the motions. If the case is allowed to remain untreated, gastritis results, and the inflammation may extend into the intestines. The child then becomes marasmic, as it is unable to assimilate its food, and dies of starvation.

Treatment.—The prophylactic treatment consists in giving the infant milk which is free from bacteria, and in keeping its bottles perfectly clean. If green diarrhœa occurs, the indication is to clear the curds out of the stomach and intestines. The administration of a teaspoonful of castor oil will usually be found to be sufficient, if the case is taken in time. Sometimes, however, this will not suffice, and then more radical measures must be taken. The food may be changed, and one or other of the various proprietary foods substituted. If this does not relieve the symptoms, it is sometimes well to feed the infant for a few days on raw beef juice and barley-water only. By this means the bacteria are starved out, so to speak, as the majority of them can exist only on milk. At the same time small doses of calomel (gr. $\frac{1}{4}$), or grey powder (gr. $\frac{1}{2}$ —1) combined with salol (gr. $\frac{1}{4}$ —1), or similar doses of salicylate of bismuth, may be given, and repeated if necessary every six or eight hours. After all offensive matter has been cleared out of the intestines, small doses of Dover's powder (gr. $\frac{1}{4}$) may be given every three or four hours to check further diarrhœa. This treatment is continued for two or three days. Then, if the diarrhœa has ceased, the infant may return to its ordinary diet. If the infant is very weak and marasmic, it requires some stimulant. This is best given in the form of white wine whey, very

dilute whiskey and water, or equal parts of champagne and water.

Scalded buttocks are best treated by extreme cleanliness, and the application of soothing dressings such as a mild dusting powder or ointment. Equal parts of boric acid and starch are suitable for the former, and zinc oxide ointment, lanoline, or hazeline for the latter. If they fail, a dressing of castor oil is often useful, and in some cases the painting of the skin with a solution of picric acid (one grain to the ounce) is most valuable.

ICTERUS NEONATORUM.

Icterus neonatorum, or infantile jaundice, occurs as a symptom in three conditions:—

(1) Physiological or simple icterus occurs in a considerable number of infants. It is variously stated to be hæmatogenous and due to the destruction of large numbers of red blood-corpuscles after birth, as a result of which a quantity of blood-pigment is set free; or to be hepatogenous and due to the resorption of bile from the capillary bile-ducts. In the latter case, the cause of the resorption is said to be a temporary stasis of bile in the capillary ducts, due to the compression of the ducts by the dilated branches of the portal vein and blood capillaries.

(2) Severe or septic icterus occurs in cases of inflammation of Glisson's capsule, the latter being usually due to extension of inflammation from the umbilicus.

(3) Icterus also occurs due to congenital diseases, as syphilis or malformation of the liver.

Treatment.—In simple icterus the infant requires no special treatment. A mild laxative, such as phosphate of soda (grs. 5—10), may be given in order to clear out the digestive tract. In septic icterus the prognosis is

very bad. Any septic condition of the umbilicus must be treated with antiseptic compresses or iodoform powder. The infant should be also given stimulants.

LATE HÆMORRHAGE FROM THE CORD.

Late or secondary hæmorrhage from the cord may occur at any time during the fortnight subsequent to delivery.

Ætiology.—It may be due to syphilis, hæmophilia, acute fatty degeneration, and hæmoglobinuria; but the commonest cause is ulceration of the umbilicus due to septic infection.

Treatment.—Such hæmorrhage is extremely difficult to check, and is, in most cases, fatal. The application of perchloride of iron, ligation of the entire umbilical ring, plugging of the umbilical fossa with plaster of Paris, and pressure of all kinds have been tried without avail. The method usually practised consists in attempting to underpin the umbilical vessels with a stout needle and then compressing them against the needle by passing a figure-of-eight ligature beneath its projecting ends.

MASTITIS.

The occurrence in the breasts of a newly-born infant of either sex of a small amount of a fluid resembling colostrum is by no means an uncommon condition. The mammary gland of the new-born has been shown to contain culs-de-sac lined by secreting cells somewhat similar to those in the adult female. The secretion of this fluid in itself is of no importance, except that it sometimes leads to ill-advised interference on the part of the nurse or mother, who rubs the breasts with the object of softening them. In consequence of this,

infection not infrequently follows, with the result that an abscess is formed.

Treatment.—If the breasts are swollen and secrete milk, all that is necessary is to protect them from pressure by the application of a pad of wool. If the secretion of milk is abundant, they may be painted with a little tincture of belladonna. If an abscess forms it must be opened at the earliest moment by means of a small radial incision, and the sac drained by inserting a piece of iodoform gauze. If this is done, the breast rapidly gets well.

OPHTHALMIA NEONATORUM.

Ophthalmia neonatorum is an infectious disease of the eyes, with which the infant may become inoculated, most frequently during the passage of the head through the vagina, more rarely subsequently to delivery.

Ætiology.—It is almost always due to the entrance of the gonococcus into the eyes, usually during the passage of the head through the vagina. It has, however, occasionally been found to have resulted from the entrance of other forms of bacterium, such as the pneumococcus, the colon bacillus, and the bacillus of Morax.

Symptoms.—The symptoms begin two days after birth, *i. e.* after infection. The eyelids become swollen and inflamed, and a purulent discharge flows from between them. In severe cases, opacities or even ulcers of the cornea may form, and so partial or complete loss of vision result.

Treatment.—Prophylactic treatment should be adopted as a routine in hospitals, also occasionally in private practice, wherever there is any reason to suspect gonorrhœal infection in the mother. It consists in wiping the eyes of the infant carefully with a soft rag the

moment the head is born, and then in dropping in two drops of a one per cent. solution of nitrate of silver.

If the infection occurs, our treatment must be more active. The eyes must be well washed with warm boric lotion five or six times a day, the lids being separated, so as to allow the pus to flow out. At the same time, two drops of a two per cent. solution of nitrate of silver are dropped into the eyes once a day. The greatest care must be taken to avoid spreading the infection by means of dirty fingers or cloths. If only one eye is infected, the sound eye must be treated with the weaker solution of nitrate of silver, and must be protected from infection. To do this, apply a small piece of lint spread with boracic ointment to the eye, and then a pad of cotton wool, held in place by a bandage. This bandage must be removed twice a day so that any subsequent infection may be at once observed. An infected eye must on no account be bandaged, as this would prevent the discharge from escaping, and cause extension of the inflammation.

RETENTION OF URINE.

Retention of urine sometimes occurs in infants of either sex during the first twenty-four hours after birth. On this account, it is always the duty of the medical attendant to enquire at the first visit after the confinement, if the infant has passed water or not.

Ætiology.—The commonest cause of retention of urine is the blockage of the orifice of the urethra by a small plug of vernix caseosa. In the male infant this plug will be found under the prepuce, in the female between the labia.

Trea'tment.—Examine the orifice of the urethra to discover, if there is any obstruction apparent, and

carefully wash away all vernix from the neighbourhood. If the infant still does not pass water, apply a warm stupe to the lower part of the abdomen, and if this fails immerse it in a hot bath, and allow it to remain in the water for a short time. By holding the hand in front of the urethral orifice, it will be possible to tell if the infant passes water or not. The administration of a couple of teaspoonfuls of cold water, while the infant is in the bath, is said to assist in causing micturition. If all these means fail, and the bladder is distended,—as determined by palpation and percussion of the abdomen, a catheter must be passed. There is usually no difficulty in passing a No. 1 or 2 catheter in the case of a male infant, or a small-sized glass female catheter in the case of a female infant.

STROPHULUS.

Strophulus, miliaria rubra, or gum is the name applied to a common rash of early infant life. It is usually caused by too much clothing, or too prolonged warmth of any kind applied to the body of the infant. Thus, it is seen on the side of the face on which the infant sleeps, and on the side of the body which is pressed against the mother when nursing—if the latter is only done with one breast (Holt). The effect of too great warmth is to cause excessive action of the sweat-glands, and this is followed by a small area of inflammation round their mouths. This inflammation results in a blockage of the ducts of the glands, and hence in the formation of numerous tiny retention cysts. The appearance of the rash is quite characteristic. It consists of scattered red papules, with a small yellowish speck in the centre—the mouth of the

obstructed gland, or sometimes of minute vesicles, or even pustules. It lasts for from two to six days, and then gradually disappears.

Treatment.—Remove any cause which may tend to promote excessive action of the sweat-glands, and apply a dusting powder, such as starch and boric acid.

THRUSH, OR STOMATITIS MYCOSA.

This is another disease which results from impure milk. It consists in the formation of small white spots on the mucous membrane of the mouth and tongue.

Ætiology.—Thrush is directly due to the implantation of a fungus, *Oïdium*, or *Saccharomyces, albicans*, on the mucous membrane of the mouth. The oïdium is found in impure milk, and the infant may become infected from milk which has decomposed upon the mother's nipple, or in a dirty bottle.

Symptoms.—Small white spots, consisting of colonies of the fungus, appear on the mucous membrane of the mouth. If untreated, the spots coalesce and form a species of false membrane, which may extend into the pharynx and œsophagus. Green diarrhœa is frequently associated with this condition.

Treatment.—The prophylactic treatment consists in washing the mother's nipples before the infant takes the breast; in having the bottle perfectly clean, if the infant is bottle-fed; and in carefully wiping the lips of the infant with a soft rag, after it has had its food. If thrush occurs, treat it at once. Wash the inside of the mouth with warm water and a soft rag, and place a teaspoonful of equal parts of glycerine of borax (B.P.) and of water in the infant's mouth, twice a day. This acts as an antiseptic, and destroys the fungus.

APPENDIX I

THE first of the following tables shows the nature and the proportion of the cases treated in the Rotunda Lying-in Hospital during the masterships of Sir W. J. Smyly, of Dr. R. D. Purefoy, and of Dr. E. H. Tweedy, and the first year of my own mastership. The second table shows the number of deaths that have occurred during the same period, and their cause. The third table shows a classification of the causes of these deaths. The fourth table shows the infant mortality for the last fifteen years.

TABLE A.

| | Master— W. J. Smyly, R.D. Purefoy, E.H. Tweedy, 1889-1896. | Master— 1896-1903 | Master— 1903-1910 | Master— H. Jellett, 1910-1911. | Total. | Average. | Percentage. |
|---------------------------------------|--|----------------------|----------------------|--------------------------------------|--------|--------------|-------------|
| Total number of labours | 8997 | 11008 | 13924 | 2208 | 36227 | 1 in 1'04 | 95'88 |
| Vertex presentations (<i>a</i>) | 8376 | 10199 | 13283 | 2072 | 33930 | 1 in 394'42 | 0'25 |
| Face " | 23 | 30 | 27 | 10 | 90 | 1 in 622'77 | 0'16 |
| Brow " | 15 | 15 | 26 | 7 | 57 | 1 in 32'77 | 3'08 |
| Pelvic " | 281 | 396 | 356 | 45 | 1078 | 1 in 303'4 | 0'33 |
| Cross births | 20 | 33 | 50 | 14 | 117 | 1 in 72'89 | 1'38 |
| Twins | 111 | 150 | 197 | 20 | 487 | 1 in 7099'6 | 0'01 |
| Triplets | 2 | 2 | 1 | 5 | 10 | 1 in 1207'56 | 0'08 |
| Hyperemesis | 6 | 9 | 12 | 3 | 30 | 1 in 1646'68 | 1'06 |
| Vesicular mole | 6 | 6 | 7 | 3 | 22 | 1 in 235'24 | 0'42 |
| Hydrannios | 26 | 83 | 42 | 3 | 154 | 1 in 29'54 | 3'38 |
| Abortions | 282 | 425 | 433 | 86 | 1226 | 1 in 227'84 | 0'44 |
| Placenta previa | 55 | 53 | 41 | 10 | 159 | 1 in 165'42 | 0'6 |
| Accidental hæmorrhage | 74 | 92 | 47 | 6 | 219 | 1 in 65'63 | 1'52 |
| Post-partum hæmorrhage | 120 | 199 | 190 | 43 | 552 | 1 in 1214'72 | 0'07 |
| Secondary post-partum hæ- morrhage | 9 | 17 | 3 | 2 | 29 | 1 in 258'76 | 0'38 |
| Hæmatoma of vulva | 2 | 8 | 6 | 14 | 140 | 1 in 1906'68 | 0'05 |
| Eclampsia | 33 | 23 | 70 | 1 | 87 | 1 in 416'4 | 0'24 |
| Rupture of uterus | 5 | 8 | 5 | 3 | 56 | 1 in 646'91 | 0'15 |
| Myoma of uterus | 14 | 56 | 14 | 1 | 7 | 1 in 5175'28 | 0'02 |
| Insanity { Mania | 11 | 28 | 17 | 1 | 7 | 1 in 5175'28 | 0'02 |
| { Melancholia | 2 | 3 | 1 | 1 | 7 | 1 in 323'45 | 0'3 |
| Pulmonary embolus | 1 | 5 | — | 1 | 112 | | |
| Induction of labour | 26 | 36 | 46 | 4 | | | |

| | | | | | | | |
|------------------------------|-------------|-------------|-------------|------------|-------------|--------------|-------|
| Manual removal of placenta | 91 | 168 | 123 | 22 | 404 | 1 in 89'67 | 1'11 |
| Forceps | 267 | 432 | 527 | 114 | 1340 | 1 in 27'03 | 3'69 |
| Version | 79 | 70 | 101 | 24 | 274 | 1 in 132'21 | 0'76 |
| Craniotomy | 12 | 9 | 4 | 2 | 27 | 1 in 1341'74 | 0'08 |
| Decapitation | 1 | 2 | 1 | 2 | 6 | 1 in 6037'83 | 0'02 |
| Cæsarean section | 3 | 4 | 16 | 7 | 30 | 1 in 1207'56 | 0'08 |
| Post-mortem Cæsarean section | — | 1 | — | 1 | 2 | 1 in 1811'35 | 0'005 |
| Symphysiotomy | 4 | — | 2 | — | 6 | 1 in 6037'83 | 0'02 |
| Porro's operation | 3 | 2 | — | — | 5 | 1 in 7245'4 | 0'01 |
| Pubiotomy | — | — | 9 | 2 | 11 | 1 in 3293'36 | 0'03 |
| Prolapse of cord | 56 | 74 | 84 | 16 | 230 | 1 in 157'51 | 0'63 |
| Morbidity | 628 | 829 | 886 | 141 | 2484 | 1 in 14'58 | 0'09 |
| Average morbidity (b) | 1 in 14'32 | 1 in 12'32 | 1 in 15'84 | 1 in 15'04 | 1 in 14'37 | — | — |
| Maternal mortality | 66 | 43 | 49 | 12 | 170 | 1 in 214'39 | — |
| Average maternal mortality | 1 in 136'31 | 1 in 253'09 | 1 in 284'16 | 1 in 184 | 1 in 214'39 | — | — |
| Percentage | 0'73 | 0'38 | 0'35 | 0'54 | 0'5 | — | — |

a. The proportion of each presentation is obtained by dividing the total number of each presentation into the total number of labours, less the total number of abortions.

b. Up to the year 1905-6 any case in which the temperature rose even once above 100'8° F. was considered "morbid." In that year the standard of morbidity was changed, and the following standard was adopted in accordance with the recommendations of a Committee appointed by the British Medical Association:—the rising of the temperature to 100° F. on at least two occasions between the second and the eighth day.

TABLE B.—*Showing Cause of Death in the Rotunda Lying-in Hospital.*

1889-90. TOTAL 10.

| Name. | Admitted. | Delivered. | Died. | Cause of death. | Notes. |
|---------|-----------|------------|----------|------------------------|---|
| C. R. | Nov. 30 | Nov. 30 | Dec. 1 | Eclampsia | Chloral and chloroform treatment. |
| S. C. | Dec. 8 | Dec. 8 | Dec. 8 | Accidental hæmorrhage | Child perforated and extracted |
| M. C. | Dec. 19 | Dec. 19 | Dec. 19 | Accidental hæmorrhage | Accouchement force |
| T. H. | Dec. 28 | Dec. 28 | Dec. 28 | Phthisis | Admitted moribund |
| L. K. | Dec. 27 | Jan. 5 | Jan. 10 | Septicæmia | Induction of premature labour by Barnes' bags. |
| J. S. | Jan. 14 | Jan. 14 | Jan. 15 | Eclampsia | Chloral and chloroform treatment and delivery by craniotomy. |
| S. H. | April 8 | April 13 | April 14 | Purulent meningitis | Suffered from influenza previous to admission. |
| M. B. | April 28 | April 30 | May 1 | Eclampsia | Autopsy. |
| L. F. | May 6 | May 7 | May 23 | Pyæmia | Chloral and chloroform treatment. |
| A. F. | June 10 | June 11 | June 22 | Septicæmia | No operation performed. |
| E. C. | June 20 | June 22 | June 25 | Phthisis | No operation performed. |
| A. B. | June 18 | June 19 | July 25 | Septicæmia (?) | Admitted in last stage. |
| E. M. | Aug. 2 | Aug. 2 | Aug. 27 | Pyæmia | No operation performed. |
| M. B. | Aug. 15 | Aug. 17 | Aug. 20 | Septicæmia | No operation performed. |
| S. P. | Aug. 16 | Aug. 23 | Sept. 5 | Septicæmia | P.M.—Large sloughing myoma uteri. |
| M. L. | Aug. 18 | Aug. 20 | Sept. 25 | Pyæmia | No operation performed. |
| M. F. | Oct. 6 | Oct. 7 | Oct. 12 | Septicæmia | Delivery by forceps. |
| B. M. | Oct. 15 | Oct. 15 | Dec. 22 | Pyæmia | No operation performed. |
| C. O'N. | Oct. 24 | Oct. 29 | Oct. 29 | Intestinal obstruction | Suffered from intestinal obstruction for some days previous to admission. |

| 1890-91 | | | | TOTAL | |
|---------|----------|----------|----------|-----------------------|--|
| M. McG. | Jan. 4 | Jan. 4 | Jan. 4 | Phthisis | |
| M. R. | Jan. 10 | Jan. 10 | Jan. 13 | Pneumonia | |
| J. L. | Feb. 1 | Feb. 1 | Feb. 1 | Accidental hæmorrhage | |
| C. M. | Mar. 2 | Mar. 2 | Mar. 2 | Accidental hæmorrhage | |
| E. C. | May 5 | May 5 | May 6 | Epilepsy | |
| N. F. | Aug. 4 | Aug. 5 | Aug. 6 | Hyperæmæsia | |
| H. B. | Aug. 4 | Aug. 5 | Aug. 9 | Pneumonia | |
| N. B. | Aug. 6 | Aug. 6 | Aug. 6 | Hæmorrhage | |
| C. K. | Oct. 2 | Oct. 3 | Oct. 3 | Rupture of uterus | |
| | | | | TOTAL 9 | |
| | | | | 1891-2. TOTAL 9. | |
| A. P. | Nov. 3 | Nov. 4 | Nov. 4 | Eclampsia | |
| M. S. | Nov. 18 | Nov. 20 | Nov. 29 | Mania | |
| H. C. | April 8 | April 9 | April 9 | Mitral disease | |
| M. M. | April 14 | April 14 | April 15 | Empyema | |
| C. A. | June 14 | June 14 | June 15 | Eclampsia | |
| A. C. | June 23 | June 24 | June 26 | Double pneumonia | |
| M. R. | June 29 | June 30 | June 30 | Hæmorrhage | |
| M. B. | July 6 | July 6 | July 7 | Pneumonia | |
| M. B. | Oct. 27 | Oct. 27 | Oct. 28 | Eclampsia | |

Admitted in last stage.

Admitted with croupous pneumonia.

Accouchement forcé.

Accouchement forcé.

History of epilepsy for years.

Vomiting for a month previous to admission.

Admitted with symptoms of pneumonia.

Maternal placenta prævia; rupture of uterus; forceps delivery; died on couch.

Long-standing case of prolapse of cervix; uterus ruptured six hours after labour began.

Chloral and chloroform treatment.

Unmarried. Temperature remained normal until 30 minutes before death, then rose to 109.4° F.

Admitted in last stage.

Chloral and chloroform treatment.

Admitted with croupous pneumonia.

Admitted with rupture of cervix and vagina; Perro's operation performed, but it failed to check hæmorrhage.

Admitted with broncho-pneumonia.

Chloral and chloroform treatment.

1892-3. TOTAL 17.

| Name. | Admitted. | Delivered. | Died. | Cause of death. | Notes. |
|----------|--------------------|--------------------|----------------------|---------------------------|--|
| M. M'C. | Dec. 17 Dec. 17 | Dec. 18 Dec. 18 | Dec. 18 Dec. 18 | Eclampsia Hæmorrhage | Chloral and chloroform treatment. Admitted with ruptured cervix owing to unskilled use of forceps. |
| M. N. | Jan. 1 | Jan. 27 | Jan. 27 | Eclampsia | Chloral and chloroform treatment. |
| M. A. H. | Mar. 9 | Mar. 10 | Mar. 10 | Phthisis | Admitted in last stage. |
| M. M. D. | April 7 | April 7 | April 8 | Septicæmia | Admitted in advanced stage of sepsis. |
| M. F. | April 2 April 2 | April 3 April 3 | April 21 April 21 | Pulmonary embolism | Occurred 18 days after delivery, subsequent to phlebo-thrombosis in leg. |
| M. H. | May 31 | May 31 | June 1 | Post-partum hæmorrhage | Myomatous uterus. |
| M. P. | June 19 | June 19 | June 19 | Mitral stenosis | Admitted in last stage. |
| M. M. C. | June 24 | June 28 | July 1 | Cerebro-spinal meningitis | Ill before admission. |
| L. C. | June 25 | June 25 | July 14 | Pyæmia | Ruptured symphysis during labour, and an abscess formed between the bones. Uterus normal. |
| C. B. | July 18 | July 18 | July 18 | Accidental hæmorrhage | Vagina plugged until labour set in, then accouchement forcé. |
| M. O'C. | July 24 | July 24 | July 29 | Sepsis | Admitted with ruptured cervix due to improper use of forceps, also septic. |
| M. A. R. | Aug. 31 | Undelivered | Sept. 9 | Uremia | |
| K. L. | Sept. 24 | Sept. 24 | Sept. 26 | Peritonitis | Admitted septic. |
| S. W. | Sept. 25 | Sept. 25 | Oct. 20 | Mania | |
| K. D. | Sept. 30 | Sept. 30 | Sept. 30 | Accidental hæmorrhage | Admitted with the vagina plugged, though membranes were ruptured; perforation followed by extraction; died on couch. |
| L. M'G. | Oct. 29 | Oct. 29 | Nov. 9 | Sapraemia | Child delivered by symphysiotomy; wound sloughed. |

MORTALITY TABLES

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| 1893-4. TOTAL 7. | | | | |
|------------------|---------|-------------|---------|---|
| | | | | Uremia |
| M. D. | Nov. 13 | Nov. 15 | Nov. 20 | Septicæmia |
| K. C. | Dec. 20 | Dec. 29 | Jan. 5 | Eclampsia (?) |
| E. D. | Feb. 19 | Feb. 19 | Feb. 24 | Syncope |
| M. K. | Aug. 18 | Aug. 18 | Aug. 19 | |
| K. K. | Aug. 15 | Aug. 16 | Aug. 19 | Hyperemesis |
| E. H. | Oct. 1 | Undelivered | Oct. 6 | Septicæmia |
| S. | Oct. 28 | Oct. 28 | Oct. 30 | Cæsarean section |
| | | | | Child putrid; physometra. Morphia treatment. Patient delivered by forceps; no hæmorrhage; died suddenly. P.M.—All organs healthy; no laceration of uterus or vagina. Died of exhaustion. Plugged before admission for accidental hæmorrhage. Died of ruptured intestine, which was injured during operation. |
| 1894-5. TOTAL 6. | | | | |
| | | | | Pyæmia |
| A. C. | Dec. 13 | Dec. 11 | Dec. 25 | Eclampsia |
| M. H. | Dec. 23 | Dec. 23 | Dec. 27 | Nephritis |
| E. L. | Feb. 9 | Undelivered | Feb. 9 | |
| C. H. | June 25 | July 1 | July 2 | Bright's disease |
| E. D. | Aug. 31 | Undelivered | Sept. 9 | Heart disease |
| M. B. | Oct. 11 | Undelivered | Oct. 13 | Bright's disease |
| | | | | Hyperemesis for six weeks before admission. Died undelivered and not in labour. Died undelivered and not in labour. |
| 1895-6. TOTAL 1. | | | | |
| M. D. | Feb. 7 | Feb. 16 | Feb. 25 | Septicæmia |
| | | | | Labour induced by bougies. |

1896-7. TOTAL 2.

| Name. | Admitted. | Delivered. | Died. | Cause of death. | Notes. |
|---------|-----------|------------|---------|-------------------------------|---|
| A. M'D. | Dec. 23 | Dec. 28 | Dec. 31 | Rupture of uterus and bladder | 6-para, 4 children born dead, 5th alive. Contracted pelvis, head allowed to mould, transverse rupture of bladder and a second rupture by attrition involving bladder and lower uterine segment. |
| L. D. | Feb. 8 | Feb. 8 | Feb. 21 | Septic endometritis | Admitted with ulcers on legs, and extensive sloughing ulceration of labia majora; no vaginal examinations were made. |

1897-8. TOTAL 6.

| | | | | | |
|---------|---------|---------|---------|------------------------------|---|
| E. O'D. | Dec. 20 | Dec. 21 | Dec. 23 | Cardiac disease | Admitted in last stage. |
| E. K. | Mar. 7 | Mar. 7 | Mar. 8 | Chronic nephritis | Admitted in last stage. |
| A. M. | Mar. 26 | Mar. 27 | Mar. 28 | Hyperemesis | Admitted in last stage. |
| K. B. | June 3 | June 4 | June 18 | Puerperal mania | Died suddenly on fifth day of mania with brain symptoms. No P.M. |
| J. D. | June 11 | June 11 | June 11 | Acute suppurative meningitis | Admitted in a comatose condition, delivered by post-mortem Cæsarean section; child asphyxiated, could not be revived. |
| M. C. | Oct. 4 | Oct. 5 | Oct. 23 | Pyæmia | Cæsarean section, contracted pelvis. |

| 1898-9. TOTAL 10. | | | | 1899-1900. TOTAL 6. | | | |
|-------------------|----------|-------------|----|----------------------------------|--|--|---|
| L. R. | Dec. 16 | D. | 16 | Pulmonary embolus (?) | | | Patient died suddenly during the second stage, labour apparently progressing normally. |
| M. O'C. | Feb. 17 | Feb. 17 | 8 | Sepsis | | | No vaginal examination. |
| E. G. | Mar. 9 | Mar. 9 | 9 | Accidental hæmorrhage | | | Patient admitted with membranes ruptured; hæmorrhage continued, and forceps were applied; some p.p.h.; death in thirty minutes. |
| M. C. | April 20 | April 21 | 24 | Sepsis | | | Porro's operation for contracted pelvis, Bright's disease. |
| M. R. | April 22 | Undelivered | 22 | Eclampsia | | | Morphia treatment; thirteen fits. |
| L. B. | Aug. 15 | Aug. 15 | 18 | Sepsis | | | Labour apparently normal; rupture of uterus discovered at the post-mortem examination. |
| R. C. | Aug. 20 | Aug. 20 | 23 | Sepsis | | | Placenta prævia; admitted septic. |
| A. T. | Oct. 10 | Oct. 10 | 17 | Sepsis | | | Placenta prævia; admitted septic. |
| L. M. | Oct. 12 | Oct. 12 | 12 | Physo-metra; pulmonary embolus | | | Admitted in a condition of collapse; fœtus putrid. |
| X. | — | — | — | — | | | Particulars of case missing. |
| | | | | | | | |
| M. D. | Feb. 11 | Feb. 11 | 12 | Hyperemesis and Bright's disease | | | Labour at full term. |
| R. M'D. | April 10 | April 10 | 24 | Acute military tuberculosis | | | |
| M. F. | June 2 | June 2 | 8 | Pulmonary embolism (?) | | | Severe asthma and bronchitis. No P.M. |
| E. B. | July 2 | July 2 | 2 | Advanced renal disease | | | Admitted moribund. |
| E. C. | July 15 | July 15 | 15 | Physometra and embolism | | | Admitted collapsed. Putrid drocephalic ætus. |
| M. B. | Sept. 30 | Sept. 30 | 2 | Hæmorrhage and shock | | | Apparently slight degree of contracted pelvis; child delivered by version; rupture of uterus found after delivery; pan-hysterectomy on account of hæmorrhage. |

1900-1. TOTAL 3.

| Name. | Admitted. | Delivered. | Died. | Cause of death. | Notes. |
|----------------|---------------------|----------------------|----------------------|------------------------|--|
| E. C. | Dec. 18 | Dec. 19 | Dec. 29 | Septic peritonitis | Fibroid tumour obstructing delivery; sent into hospital in labour; the membranes ruptured; Caesarean section performed. |
| B. F. M. B. | April 17 Sept. 5 | April 17 Sept. 10 | April 25 Sept. 22 | Phthisis Septicæmia | Admitted in very advanced state. Induction of labour for contracted pelvis; considerable difficulty in starting labour. |

1901-2. TOTAL 6.

| | | | | | |
|----------|----------|-------------|----------|---------------------------------|--|
| E. H. | Jan. 17 | Undelivered | Jan. 17 | Concealed accidental hæmorrhage | Plugging and binder; admitted moribund. |
| J. M'C. | Mar. 20 | Mar. 30 | Mar. 30 | Hydatidiform mole | Cause of death obscure. |
| M. J. M. | April 7 | Undelivered | April 7 | Eclampsia | Morphia treatment; six months pregnant; not in labour. |
| B. M'L. | April 14 | Undelivered | April 14 | Eclampsia | Morphia treatment; not in labour. |
| J. D. | April 28 | April 28 | May 13 | Puerperal sepsis | Forceps delivery. Typical signs of tubercular peritonitis; no P.M. |
| A. C. | July 15 | July 15 | July 22 | Pneumonia | |

| 1902-3. TOTAL 9. | | | | | | | |
|-------------------|----------|----------|----------|--|--|--|--|
| C. G. | Dec. 27 | Dec. 28 | Dec. 28 | | | | |
| L. S. | Jan. 18 | Jan. 18 | Feb. 22 | | | | |
| M. C. | Jan. 20 | Jan. 20 | Jan. 23 | | | | |
| M. G. | Jan. 23 | Jan. 23 | Feb. 2 | | | | |
| A. F. | Feb. 4 | — | Feb. 4 | | | | |
| B. W. | Feb. 5 | Feb. 5 | Feb. 8 | | | | |
| E. M. | Feb. 16 | Feb. 17 | Feb. 17 | | | | |
| E. E. | May 4 | — | May 4 | | | | |
| M. O. | May 30 | — | May 31 | | | | |
| | | | | | | | |
| 1903-4. TOTAL 13. | | | | | | | |
| K. M. | Dec. 30 | Dec. 30 | Dec. 30 | | | | |
| A. I. | Jan. 21 | Jan. 22 | Jan. 27 | | | | |
| M. E. | Feb. 17 | Feb. 18 | Mar. 8 | | | | |
| L. M. | Mar. 6 | Mar. 7 | April 1 | | | | |
| M. D. | April 13 | April 13 | April 18 | | | | |
| E. P. | April 13 | April 13 | April 15 | | | | |
| E. McE. | April 16 | April 16 | June 9 | | | | |
| A. S. | April 23 | April 24 | May 5 | | | | |
| M. W. | April 27 | April 27 | May 12 | | | | |
| A. M. | Mar. 16 | Mar. 17 | May 23 | | | | |
| M. McD. | May 15 | May 15 | May 30 | | | | |
| S. B. | June 23 | June 23 | July 27 | | | | |
| E. G. | Oct. 12 | Oct. 12 | Oct. 20 | | | | |

Rupture occurred 24 hours before admission.
Labour normal.
Rupture occurred at commencement of second stage; delivery by forceps.
Membrane ruptured 7 days before delivery; putrid fœtus.
Admitted comatose; died undelivered.
Placenta removed manually.
Occurred after expulsion of placenta; labour otherwise normal.
Had 12 fits before admission; died undelivered.
Admitted comatose; died three hours after, undelivered.

Hæmorrhage checked by plugging, but patient died apparently from shock.
Version and extraction followed by hysterectomy on account of laceration.

Delivery by forceps.

Vagina plugged prior to admission on account of placenta prævia.
Secondary p.p.h.

Putrid fœtus, 7th month.

1904-5. TOTAL 6.

| Name. | Admitted. | Delivered. | Died. | Cause of death. | Notes |
|----------------|---------------------|---------------------|---------------------|-------------------------|---|
| M. C. | Nov. 11 | Nov. 11 | Nov. 14 | Eclampsia | Fits commenced after delivery. P.M. showed extensive degeneration of liver. |
| M. K. | May 24 | May 25 | May 25 | Collapse | Rupture of uterus occurred prior to admission from obstructed delivery; child delivered by forceps; rent in cervix plugged; death in a few hours. |
| M. K. | May 25 | May 26 | May 26 | Eclampsia | Death occurred 5½ hours after delivery and 11 hours after the last fit. |
| S. O'K. | June 30 | June 30 | July 8 | Septicæmia | Labia and thighs covered with syphilitic ulcers at time of admission. |
| A. D. M. C. | Sept. 18 Oct. 19 | Sept. 18 Oct. 20 | Sept. 26 Oct. 27 | Pneumonia Septicæmia | Admitted with membranes ruptured and the leg of a macerated fetus protruding through vulva. |

1905-6. TOTAL 8.

| | | | | | |
|---------|---------|---------|---------|---------------------------------|---|
| A. H. | Mar. 3 | Mar. 3 | Mar. 4 | Syncope | Normal labour; died five or six hours after delivery; very slight hæmorrhage. |
| E. C. | Mar. 16 | Mar. 16 | Mar. 16 | Placenta prævia | Admitted in collapsed condition. |
| E. N. | May 19 | May 20 | June 25 | Pyæmia | Admitted with the disease. |
| M. O'N. | June 24 | June 25 | July 13 | Enteric | Normal labour; slight amount of hæmorrhage. |
| M. K. | July 20 | July 22 | July 22 | Syncope | Vaginal tampon tried without success. |
| M. M. | Aug. 8 | Aug. 8 | Aug. 8 | Concealed accidental hæmorrhage | |
| M. G. | Oct. 14 | — | Oct. 14 | Eclampsia | Twenty-six fits; patient died undelivered. |
| E. H. | Oct. 27 | Oct. 27 | Oct. 27 | Syncope | Normal labour save for protracted 3rd stage; slight amount of hæmorrhage. |

1906-7. TOTAL 7.

| | | | | | | | | |
|-------|-------|----|-------|----|-------|----|---------------------|--|
| A. C. | Feb. | 3 | Feb. | 3 | Feb. | 17 | Hemiplegia | Acute rheumatism. |
| R. L. | Feb. | 19 | Feb. | 19 | Mar. | 2 | General septicaemia | Normal delivery; marked cerebro-spinal symptoms. |
| M. D. | Mar. | 4 | Mar. | 4 | Mar. | 11 | General peritonitis | Manual removal of placenta. |
| M. R. | May | 2 | May | 3 | May | 5 | Eclampsia | |
| S. N. | May | 19 | May | 20 | May | 23 | General peritonitis | Difficult version. |
| M. R. | Aug. | 12 | Aug. | 14 | Oct. | 15 | Pyæmia | Normal delivery. |
| A. C. | Sept. | 18 | Sept. | 18 | Sept. | 19 | Eclampsia | |

1907-8. TOTAL 7.

| | | | | | | | | |
|----------|------|----|------|----|------|----|--|---|
| A. F. | Dec. | 22 | Dec. | 23 | Dec. | 23 | Syncope | Cesarean section; adherent placenta. |
| A. O'B. | Jan. | 26 | Jan. | 26 | Mar. | 10 | Pyæmia | Vaginal discharge, with scalding of buttocks and groins on admission. |
| S. A. A. | Jan. | 29 | Jan. | 31 | Feb. | 1 | Eclampsia | Aortic stenosis; mitral regurgitation. |
| W. C. | Feb. | 8 | Feb. | 9 | Mar. | 5 | Puerperal insanity | Induction of labour. |
| C. C. | June | 1 | June | 9 | June | 18 | Uræmia, chronic nephritis and endocarditis | |
| M. C. | June | 14 | June | 15 | July | 1 | General peritonitis | Developed suddenly on 16th day of puerperium. |
| K. M'A. | Aug. | 7 | Aug. | 8 | Aug. | 11 | General peritonitis | Incomplete abortion. |

1908-9. TOTAL 4.

| | | | | | | | | |
|-------|------|----|------|----|------|----|-------------------------------|---|
| B. K. | Nov. | 17 | Nov. | 18 | Dec. | 8 | Sepsis | Hydramnios; anencephalus. |
| M. M. | July | 31 | Aug. | 3 | Aug. | 5 | Pulmonary tuberculosis | Very advanced stage. |
| E. M. | Aug. | 3 | Aug. | 4 | Aug. | 4 | Rupture of uterus, and sepsis | Admitted with putrid fætus hanging half out of cervix, and uterus ruptured; died in 12 hours. |
| M. M. | Aug. | 20 | Aug. | 20 | Aug. | 20 | Hydramnios and shock | Twins; collapse after rupture of membranes and large amount of liquor amnii had escaped. |

1909-10. TOTAL 4.

| Name. | Admitted. | Delivered. | Died. | Cause of death. | Notes. |
|---------|-----------|------------|---------|--|--|
| M. D. | May 3 | May 3 | May 17 | Sepsis; infarct of spleen | |
| C. K. | June 26 | June 26 | June 26 | Rupture of vagina ; hæmorrhage | |
| M. O'B. | July 27 | July 27 | Aug. 4 | Acute dilatation of heart ; œdema of lungs | Got out of bed 7th evening after normal puerperium ; died in 10 minutes. |
| J. W. | Oct. 17 | Oct. 17 | Oct. 21 | Pneumonia | |

1910-11. TOTAL 12.

| | | | | | |
|----------------|--------------------|--------------------|---------|--|---|
| J. S. | Jan. 9 | Jan. 9 | Jan. 9 | Eclampsia ; intra-peritoneal hæmorrhage | Eclampsia ; died shortly after admission from intra-peritoneal hæmorrhage due to ruptured mesenteric vein. P.M. Cesarean section. |
| M. C. | Jan. 12 | Jan. 12 | Jan. 21 | Pyæmia | Thrombosis of left ovarian vein and infarcts of spleen and lungs. |
| M. K. | Feb. 4 | Feb. | Feb. 11 | General septic peritonitis | Admitted with history of abdominal pain and symptoms of severe shock ; delivered herself ; foetid liquor amnii. P.M.—Gangrenous appendix with purulent peritonitis. |
| M. S. J. F. | Mar. 20 Mar. 28 | Mar. 22 Mar. 28 | Mar. 29 | Acute phthisis Pulmonary embolus ; phthisis | Placenta prævia ; sudden onset of dyspnoea and collapse on 15th day ; death in 2 minutes ; advanced phthisis. |
| M. K. | June 25 | June 25 | June 25 | Concealed accidental hæmorrhage | Radical Cesarean section ; intra peritoneal hæmorrhage from ruptured vein in broad ligament. |

| | | | | | |
|----------------|-----------------|-----------------------------|--------------------|---|---|
| E. C. M. M. | July Aug. 17 | July 22 Unde- livered | July 22 Aug. 17 | Eclampsia Concealed accidental hæmorrhage | Admitted pulseless; no treatment. Pulseless and cyanosed on admission; version, as placenta was partly in lower uterine segment. |
| A. F. | Aug. 23 | Aug. 24 | Aug. 24 | Placenta prævia | Plugged twice because membranes not rup- tured; placenta in lower uterine segment and version impossible. |
| M. M. | Aug. 29 | Aug. 30 | Aug. 30 | Acute sepsis | Large cervical fibroid obstructing labour; shelled out and child delivered by forceps; had been examined "about 20 times" in country. |
| M. K. | Sept. 12 | Sept. 14 | Sept. 22 | Pyæmia | Treated with streptococcal vaccines. P.M.— Infection found to be staphylococcal. |
| M. L. | Oct. 24 | Oct. 24 | Nov. 14 | Hyperemesis gravi- darum: pyæmia | Induction of labour; bipolar version. P.M.— Thrombosis right ovarian vein; abscesses in kidneys, liver, breasts; <i>Staphylococcus</i> <i>aureus</i> . |

TABLE C.

In the following table an attempt has been made to classify the causes of the deaths recorded in Table B. These causes have been divided into three groups:—Group I, purely obstetrical causes; Group II, pre-existing disease of the mother; Group III, accidental causes, by which is meant causes which might have been avoided. As will be seen, the principal component of this group is some form of septic infection.

| Group I.—Purely obstetrical causes. | | Group II.—Pre-existing disease. | | Group III.—Accidental causes. | |
|-------------------------------------|---------------|---------------------------------|---------------|---------------------------------------|---------------|
| Cause of death. | No. of cases. | Cause of death. | No. of cases. | Cause of death. | No. of cases. |
| Accidental hæmorrhage | 12 | Eclampsia | 22 | Septicæmia | 21 |
| * Rupture of uterus | 14 | Phthisis | 9 | Pyæmia | 14 |
| Mania | 4 | Meningitis | 3 | Sapremia | 1 |
| Pulmonary embolus | 5 | Epilepsy | 1 | Septic endometritis | 1 |
| Post partum hæmorrhage | 2 | Pneumonia | 8 | Septic peritonitis | 6 |
| Cæsarean section | 4 | Hyperemesis | 4 | Septic infection (form not specified) | 8 |
| † Placenta prævia | 2 | Cardiac disease | 6 | Intestinal obstruction | 1 |
| Vesicular mole | 1 | Empyema | 1 | Gangrenous appendicitis | 1 |
| Rupture vagina | 1 | Uræmia | 4 | | |
| | | Cardiac syncope | 6 | | |
| | | Nephritis | 5 | | |
| | | Miliary tuberculosis | 1 | | |
| | | Enteric | 1 | | |
| | | Hemiplegia | 1 | | |
| Total | 45 | Total | 72 | Total | 53 |

Cause of death not stated, 1 case. Total of deaths, 171.

* Two of these cases were septic, and are not included in the figures in Group III.

† In addition, one case of placenta prævia died of ruptured uterus, one of pulmonary embolus and advanced phthisis, and two of sepsis.

TABLE D.—*Infant Mortality.*

| | 1890-1903. | 1903-4. | 1904-5. | 1905-6. | 1906-7. | 1907-8. | 1908-9. | 1909-10. | 1910-11. | Total. | Average. |
|--|------------|---------|---------|---------|---------|---------|---------|----------|----------|--------|--------------|
| Number of births | 10782 | 1887 | 1904 | 1904 | 1902 | 2060 | 2045 | 2222 | 2151 | 26857 | — |
| Premature deaths, recent | 168 | 20 | 18 | 20 | 19 | 22 | 9 | 10 | 21 | 307 | 1 in 87.48 |
| Full-term deaths, recent | 212 | 32 | 39 | 40 | 30 | 40 | 20 | 16 | 22 | 451 | 1 in 59.55 |
| Macerated | 207 | 48 | 52 | 41 | 40 | 39 | 43 | 43 | 31 | 544 | 1 in 49.4 |
| Putrid | 13 | 1 | — | — | — | 3 | 4 | 2 | 2 | 25 | 1 in 1074.26 |
| Total number born dead | 600 | 101 | 109 | 91 | 89 | 104 | 76 | 71 | 76 | 1317 | 1 in 20.39 |
| Infants born alive who died in hospital | 248 | 40 | 34 | 30 | 21 | 22 | 36 | 27 | 27 | 485 | 1 in 55.38 |
| Total number born dead or died in hospital | 848 | 141 | 143 | 121 | 110 | 126 | 112 | 98 | 103 | 1802 | 1 in 14.9 |

APPENDIX II.

A NEW TABLE FOR DETERMINING THE APPROXIMATE DATE OF DELIVERY FROM THE HEIGHT OF THE UTERUS.

The Height of the Uterus.

| A Two fingers above symphysis | B Half way between symphysis and umbilicus | C At umbilicus | D Three fingers above umbilicus | E Half way between umbilicus & ensiform cartilage | F At ensiform cartilage | G Approximate date of delivery. |
|--|---|----------------------|--|--|-------------------------------|--|
| Jan. 1 | Jan. 29 | Feb. 26 | Mar. 26 | Apr. 23 | May 21 | June 18 |
| Feb. 15 | Feb. 12 | Mar. 12 | April 9 | May 7 | June 4 | July 2 |
| Feb. 1 | Mar. 1 | Mar. 29 | April 26 | May 24 | June 21 | July 19 |
| Mar. 15 | " 15 | April 12 | May 10 | June 7 | July 5 | Aug. 2 |
| Mar. 1 | " 29 | April 26 | May 24 | June 21 | July 19 | Aug. 16 |
| " 15 | April 12 | May 10 | June 7 | July 5 | Aug. 2 | Sept. 30 |
| April 1 | " 29 | June 27 | July 24 | Aug. 22 | Sept. 19 | Sept. 16 |
| April 15 | May 13 | June 10 | July 8 | Aug. 5 | Sept. 2 | Oct. 30 |
| May 1 | " 29 | July 26 | Aug. 24 | Sept. 21 | Oct. 18 | Oct. 16 |
| May 15 | June 12 | July 10 | Aug. 7 | Sept. 4 | Oct. 2 | Oct. 30 |
| June 1 | " 29 | Aug. 27 | Sept. 24 | Oct. 21 | Nov. 19 | Nov. 16 |
| June 15 | July 13 | Aug. 10 | Sept. 7 | Oct. 5 | Nov. 2 | Nov. 30 |
| July 1 | " 29 | Sept. 26 | Oct. 23 | Nov. 21 | Dec. 19 | Dec. 16 |
| July 15 | Aug. 12 | Sept. 9 | Oct. 7 | Nov. 4 | Dec. 2 | Jan. 30 |
| Aug. 1 | " 29 | Oct. 26 | Nov. 24 | Dec. 21 | Jan. 19 | Jan. 16 |
| Aug. 15 | Sept. 12 | Oct. 10 | Nov. 7 | Dec. 5 | Jan. 2 | Feb. 30 |
| Sept. 1 | " 29 | Oct. 27 | Nov. 24 | Dec. 22 | Jan. 19 | Feb. 16 |
| Sept. 15 | Oct. 13 | Nov. 10 | Dec. 8 | Jan. 5 | Feb. 2 | Mar. 2 |
| Oct. 1 | " 29 | Dec. 26 | Jan. 24 | Feb. 21 | Mar. 18 | Mar. 18 |
| Oct. 15 | Nov. 12 | Dec. 10 | Jan. 7 | Feb. 5 | Mar. 4 | April 1 |
| Nov. 1 | " 29 | Jan. 27 | Feb. 24 | Mar. 21 | April 19 | April 18 |
| Nov. 15 | Dec. 13 | Jan. 10 | Feb. 7 | Mar. 5 | April 4 | May 2 |
| Dec. 1 | " 29 | Feb. 26 | Mar. 23 | April 21 | May 20 | May 18 |
| " 15 | Jan 12 | Feb. 9 | Mar. 9 | April 6 | May 4 | June 1 |

Rules for the Use of the Table.

1. Note the height of the uterus in the patient's abdomen and the day of the month. Look down the column belonging to that particular height until you reach the corresponding date. Then read horizontally across the Table, and the date of delivery will be found in the last column. Thus:—The uterus reaches to the umbilicus on June 10th. Read down Column C until you come to June 10th, and then reading horizontally across the Table you find in the last column September 30th as the approximate day of delivery.

2. If the day of the month does not correspond with any date in the proper column, proceed as follows.—Ascertain the day of delivery counting from the nearest earlier date in the proper column. Add to this

date the difference between the day of the month and the date from which we have counted. The result will be the day of delivery. Thus.

—The uterus is half way between the umbilicus and the ensiform cartilage on July 17th. The proper column is E, and the nearest earlier date in it is July 30th, making the day of delivery August 30th. The difference between July 17th and July 30th is twelve days, and this added to August 30th gives September 11th as the approximate day of delivery.

3. If the height of the uterus does not correspond with any of the headings in the Table, proceed as follows. Ascertain the day of delivery by Rule 1, using the column whose heading corresponds with the fixed level next below the actual height of the uterus. Then measure in finger-breadths the height of the uterus above the fixed level, and also the distance between this level and the fixed level immediately above it. Find what fraction the first distance is of the second, take this fraction of twenty-eight days and add it to the date already ascertained, and the result will be the day of delivery. Thus, if the actual height of the uterus on September 9th is two finger-breadths above the umbilicus.

The fixed level immediately below it is the umbilicus. Therefore, ascertain the date of delivery in Column C. This date is December 1st. The next fixed level is three fingers above the umbilicus. Therefore the actual height of the uterus is two-thirds the distance between the two fixed levels. Take two-thirds of twenty-eight days, *i. e.* approximate eighteen days, and add this to December 1st. The result—January 17th—will be the approximate day of delivery.

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